

THE SPACE LAW
REVIEW

Editor
Joanne Wheeler MBE

THE LAWREVIEWS

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REVIEW

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This article was first published in December 2019
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Published in the United Kingdom
by Law Business Research Ltd, London
Meridian House, 34-35 Farringdon Street, London, EC4A 4HL, UK
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www.TheLawReviews.co.uk

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ISBN 978-1-912228-79-9

Printed in Great Britain by
Encompass Print Solutions, Derbyshire
Tel: 0844 2480 112

ACKNOWLEDGEMENTS

The publisher acknowledges and thanks the following for their assistance throughout the preparation of this book:

ALDEN LEGAL LIMITED

ARENDT & MEDERNACH

BIRD & BIRD

GVW GRAF VON WESTPHALEN

HUDSON GAVIN MARTIN

MORI HAMADA & MATSUMOTO

SHERMAN & HOWARD LLC

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PREFACE

I am honoured to introduce the first edition of *The Space Law Review*.

It seems appropriate to be writing this introduction in 2019, the 50th anniversary of the first human landing on the Moon on 20 July 1969 as part of NASA's Apollo 11 lunar mission. This anniversary has further raised awareness of the value of space activities, whether from a scientific perspective, in a commercial context or simply to inspire the next generations.

I am hugely appreciative of the time and dedication of the lawyers who have contributed to this first edition, and more importantly for embracing space law as a practice area. The importance of *The Space Law Review* will grow each year as the value of space activities increases, further applications of satellite technology are brought into use and the commercial revenues from the industry are recognised. Lawyers will be required to understand the international treaties, how they are enforced and applied in national law and apply such laws, regulations and policies, potentially creatively, to new technologies and business models.

The economic benefits from the space sector are beginning to be recognised by states. The global space economy is expected to be worth £40 billion by 2030. The productivity of the space sector tends to be much larger than national averages.

New and innovative technologies increasingly derive from private commercial activities rather than the more traditional government-funded missions. States are responsible for national activities in outer space and therefore seek to supervise and authorise such activities through national legislation and licensing mechanisms.

New technology such as CubeSats, constellations of thousands of satellites, in-orbit servicing, high-resolution Earth observation data and new small-launcher technology are testing regulatory and insurance frameworks, and offer challenges to regulators that must work very closely with industry, using ideally anticipatory and outcome-focused regulation, to govern such activities. We are seeing new insurance models and financial security concepts being considered by regulators in the granting of launch and operations licences.

Efficient national regulation, which enables innovation effectively, is an increasingly important source of competitive advantage globally. We are witnessing more regulatory forum shopping than ever before in the space industry.

Regulators are required to achieve a balance between:

- a* managing government risk and liability, compliance with international obligations, safety, security and the sustainable use of and access to space; and
- b* encouraging commercialisation, innovation and growth, the benefits to society of new technology and attractiveness to foreign investment.

What is being recognised is that effective national regulation is an enabler to new and innovative satellite technology and the ability to raise finance.

On a personal note, this industry has been my passion for over 27 years. In that time, it has evolved from government-led telecommunications cooperatives to a competitive commercial innovative market, with applications that I would not have imagined in my lifetime. We are now seeing a paradigm shift in technology and opportunities in an industry that is growing with drive and determination; lawyers and regulators need to fully engage with the industry to keep up with it. It is a fascinating industry to engage with.

I thank my professor of space law, the lawyers and clients who supported me over the years, and most of all the contributors again, and hope that readers enjoy this edition and recognise the unique value that the international space industry can bring us on Earth.

Joanne Wheeler MBE

Alden Legal Limited

London

November 2019

EUROPE

Joanne Wheeler MBE and Vicky Jeong¹

I INTRODUCTION

The European Space Agency (ESA) and the European Union (EU) each coordinate the financial and intellectual resources of EU Member States to undertake space programmes. In doing so, both intergovernmental bodies are influential in shaping Europe-wide industrial space policy.

It is, however, important to distinguish that ESA is an international intergovernmental organisation that is independent of the EU. ESA and the EU entered into a framework agreement in 2004 to provide operational arrangements between them based on the principles of efficiency and mutual benefit, to avoid any unnecessary duplication of effort and to achieve a coherent and progressive development of an overall European space policy.

II ESA

i History of ESA and its membership

In 1962, a selection of European states signed two conventions to establish two separate agencies: the European Launcher Development Organisation (ELDO) to develop a launch system; and the European Space Research Organisation (ESRO) to develop spacecraft. ESRO and ELDO were then merged to create ESA in 1975.

The purpose of ESA is ‘to provide for and to promote, for exclusive peaceful purposes, cooperation among European States in space research and technology and their space applications’.²

ESA is headquartered in Paris, France and has 22 Member States.³ Slovenia is an Associate Member, Canada takes part in some projects under a cooperation agreement and Bulgaria, Croatia, Cyprus, Malta, Latvia, Lithuania and Slovakia are currently in the Plan for European Cooperating States.

1 Joanne Wheeler MBE is the managing partner and Vicky Jeong is an associate at Alden Legal Limited.

2 This is set forth in Article II of the Convention for the Establishment of a European Space Agency (the ESA Convention), accessible at: https://esamultimedia.esa.int/docs/LEX-L/ESA-Convention/SP-1317_EN.pdf.

3 These are: Austria; Belgium; the Czech Republic; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; the Netherlands; Norway; Poland; Portugal; Romania; Spain; Sweden; Switzerland; and the United Kingdom.

ii ESA establishments and facilities

ESA has multiple establishments and facilities⁴ that are situated in a number of European countries. These include:

- a* the European Astronauts Centre in Cologne, Germany, which is an astronaut training centre for European astronauts;⁵
- b* the European Space Astronomy Centre (ESAC) in Villanueva de la Canada, Spain, which houses the scientific operations centres for astronomy and planetary missions;⁶
- c* the European Space Operations Centre (ESOC) in Darmstadt, Germany, which houses control rooms that are linked to ground stations to track and control satellites and carry out systems monitoring and payload operations;⁷
- d* the ESA centre for Earth Observation (ESRIN) in Frascati, Italy, which manages ground segment and third-party Earth observation satellites;⁸
- e* the European Space Research and Technology Centre (ESTEC) in Noordwijk, Netherlands, which is responsible for the technical preparation, management and support and houses a test centre;⁹
- f* the European Centre for Space Applications and Telecommunications (ECSAT) in Harwell, United Kingdom, which provides support to activities related to telecommunications and integrated applications;¹⁰
- g* the European Space Security and Education Centre in Redu, Belgium, which houses a centre for space cybersecurity services, the Space Weather Data Centre and the ESA Education Training Centre;¹¹ and
- h* the Guiana Space Centre in Kourou, French Guiana, which houses launch and launcher production facilities and the launch base.¹²

iii Governance

Article X of the ESA Convention defines two organs for governing ESA: the Council and the Director General.

The Council is represented by the ESA Member States¹³ and meets as and when required¹⁴ either at delegate level (at least twice a year) or ministerial level (around every four years).¹⁵ Each ESA Member State has one vote irrespective of their geographical size or financial contribution¹⁶ and is represented by a maximum of two delegates¹⁷ who may be accompanied by advisers.¹⁸

4 https://www.esa.int/About_Us/Welcome_to_ESA/Establishments_and_facilities.

5 https://www.esa.int/About_Us/EAC.

6 https://www.esa.int/About_Us/ESAC.

7 https://www.esa.int/About_Us/ESOC.

8 https://www.esa.int/About_Us/ESRIN.

9 https://www.esa.int/About_Us/ESTEC.

10 https://www.esa.int/About_Us/Welcome_to_ESA/ECSAT.

11 https://www.esa.int/About_Us/Welcome_to_ESA/ESEC.

12 https://www.esa.int/Our_Activities/Space_Transportation/Europe_s_Spaceport/Europe_s_Spaceport2.

13 Article XI(1) of the ESA Convention and Rule 1(1) of the ESA Council Rules of Procedure.

14 Article XI(2) of the ESA Convention and Rule 1(1) of the ESA Council Rules of Procedure.

15 https://www.esa.int/About_Us/Law_at_ESA/Ministerial_Council_Meetings2.

16 Article XI(6)(a) of the ESA Convention.

17 Rule 1(2) of the ESA Council Rules of Procedure.

18 Rule 3 of the ESA Council Rules of Procedure.

The Council elects a chairman and two vice-chairmen every two years.¹⁹ The Council also has a Science Programme Committee that is responsible for mandatory scientific programmes²⁰ and other subordinate bodies to assist the Council's duties.²¹ The Council is further assisted by the Bureau of the Council that consists of the chairman and one authorised representative per ESA Member State.²²

The Director General is appointed every four years by the Council by a two-thirds majority of all ESA Member States.²³ The Director General acts as the Chief Executive Officer of ESA and its legal representative and is responsible for managing ESA, executing its programmes, implementing its policy and fulfilling its purpose²⁴ with authority over its establishments that are listed above.

ESA's Director General is assisted by 10 directors:

- a* the Director of Technology, Engineering and Quality who also heads ESTEC;
- b* the Director of Human and Robotic Exploration;
- c* the Director of Industry, Procurement and Legal Services who also heads ESA's headquarters in Paris;
- d* the Director of Space Transportation;
- e* the Director of Earth Observation who also heads ESRIN;
- f* the Director of Navigation;
- g* the Director of Science who also heads ESAC;
- h* the Director of Telecommunications and Integrated Applications who also heads ECSAT;
- i* the Director of Internal Services; and
- j* the Director of Operations who also heads ESOC.

iv Procurement of ESA activities

ESA's procurement framework consists of:

- a* Article VII and Annex V of the ESA Convention, which sets out ESA's industrial policy;
- b* ESA Procurement Regulations and related Implementing Instructions;²⁵ and
- c* general clauses and conditions for ESA contracts.²⁶

All procurement is handled through ESA's Electronic Mailing Invitation to Tender System, which maintains all current invitations to tenders and intended invitations to tenders.

The primary focus of ESA's industrial policy is to ensure equitable Member State participation based on the financial contribution of Member States when implementing ESA space programmes and the associated development of space technology.²⁷ All ESA

19 Rule 5(1) of the ESA Council Rules of Procedure.

20 Article XI(8)(a) of the ESA Convention.

21 Article XI(8)(b) of the ESA Convention. ESA's plenary subordinate bodies include Administrative and Finance Committee, Industry Policy Committee, International Relations Committee and Security Committee: https://www.esa.int/About_Us/Law_at_ESA/ESA_s_organs_and_functioning.

22 Rule 7 of the ESA Council Rules of Procedure.

23 Article XII(1)(a) of the ESA Convention.

24 Article XII(1)(b) of the ESA Convention.

25 https://download.esa.int/docs/LEX-L/Contracts/ESA-REG-001_rev5_EN.pdf.

26 https://esamultimedia.esa.int/docs/LEX-L/Contracts/ESA-REG-002_rev3_EN.pdf.

27 https://www.esa.int/About_Us/Business_with_ESA/Business_Opportunities/ESA_an_intergovernmental_customer.

programmes are also computed based on geographical return, which takes into account the share of a country in the weighted value of contracts and its share in the contribution paid to ESA in a given period.²⁸

There are three types of ESA activities: mandatory activities; optional activities; and 'third parties activities'.

All ESA Member States participate in mandatory activities for which each Member State makes contributions based on its gross national product. Mandatory activities are approved by the Council.

Optional activities include programmes for which each Member State can choose its level of participation and contribution. Examples of optional activities include launchers, Earth observation, telecommunications, manned flights and the International Space Station.

Third parties activities include programmes where ESA receives funding to manage space-related activities on behalf of other organisations such as the EU or the European Organisation for the Exploration of Meteorological Satellites (Eumetsat). The industrial participation in third parties activities is regulated by each respective agreement.

III EU SPACE PROGRAMMES AND POLICY

Article 189 of the Treaty on the Functioning of the European Union (TFEU) gives the mandate to the EU to draw up a European space policy and to establish a European space programme to promote scientific and technical progress and to coordinate the exploration and exploitation of space. However, Article 189(2) of the TFEU excludes 'any harmonisation of laws and regulations' of EU Member States in relation to space.

The current flagship space programmes that are run by the EU include:

- a the European satellite navigation programmes, Galileo and the European Geostationary Navigation Overlay Service (EGNOS);
- b the Copernicus Earth Observation space programme; and
- c the EU Space Surveillance and Tracking (EUSST) programme.

European satellite navigation programmes

*Galileo*²⁹

Galileo is the global navigation satellite system (GNSS)³⁰ that is owned by the EU to provide high-precision positioning, navigation and timing information for services and users in the EU. Galileo's principal objective is to minimise dependence on the use of foreign navigation systems such as the US's Global Positioning System, the Russian Global Navigation Satellite System and the Chinese BeiDou Navigation Satellite system.

The European Commission (the Commission) has overall responsibility for managing and overseeing the implementation of the Galileo programme and the European GNSS Agency (GSA). The GSA is an EU agency that has delegated responsibility for the development

28 https://www.esa.int/About_Us/Business_with_ESA/How_to_do/Industrial_policy_and_geographical_distribution.

29 To find more information about Galileo, see: <https://www.gsa.europa.eu/european-gnss/galileo/galileo-european-global-satellite-based-navigation-system>.

30 To find more information about GNSS, see: <https://www.gsa.europa.eu/european-gnss/what-gnss>.

and operational management of the Galileo programme from the Commission. The design, deployment, evolution and technical development of the infrastructure are outsourced to ESA.

*EGNOS*³¹

EGNOS is a European regional satellite-based augmentation system that is used to augment GNSS signals to improve the accuracy and reliability of GNSS performance. EGNOS was developed under a tripartite agreement between ESA (responsible for the design and development of the system), the Commission (responsible for international cooperation and coordination, operational management and maintenance of the system) and the European Organisation for the Safety of Air Navigation (responsible for defining the needs of civil aviation and deriving the mission requirements of the system).³² In 2009, the Commission designated the operational management and maintenance of EGNOS to the European Satellite Services Provider.³³

*Copernicus Earth observation*³⁴

Copernicus, also known as the Global Monitoring for Environment and Security programme, is the EU's Earth observation programme intended to provide a unified system through which accurate, timely and easily accessible information is collected to improve the management of the environment, understand and mitigate the effects of climate change and ensure civil security.³⁵ Copernicus has a free and open data policy providing six categories of services: atmosphere;³⁶ climate change;³⁷ emergency;³⁸ land;³⁹ marine;⁴⁰ and security.⁴¹

Copernicus is coordinated and managed by the Commission and is implemented in partnership with ESA, Eumetsat, the European Centre for Medium-Range Weather Forecasts and Mercator Ocean.

SST

The SST programme was set up in 2014 to develop SST capability at EU level to protect EU space infrastructure, facilities and services by creating a network of ground-based and space-based sensors to survey and track orbital objects for the EU user community. The SST programme provides analysis and information on conjunction (i.e., collision avoidance), re-entry (e.g., estimation of time frame and likely location of possible impact) and in-orbit fragmentation (i.e., detection and characterisation, including alerts on break-ups or collisions).

31 To find more information about EGNOS, see: <https://www.gsa.europa.eu/egnoss/what-egnoss>.

32 https://m.esa.int/Our_Activities/Navigation/EGNOS/Who_s_involved_in_EGNOS.

33 <https://www.gsa.europa.eu/european-gnss/egnoss/faq#operateegnoss>.

34 To find more information about Copernicus, see: <https://www.copernicus.eu/en/about-copernicus/copernicus-brief>.

35 https://m.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Overview3.

36 <https://www.copernicus.eu/en/services/atmosphere>.

37 <https://www.copernicus.eu/en/services/climate-change>.

38 <https://www.copernicus.eu/en/services/emergency>.

39 <https://www.copernicus.eu/en/services/land>.

40 <https://www.copernicus.eu/en/services/marine>.

41 <https://www.copernicus.eu/en/services/security>.

IV FUTURE OF ESA AND EU COOPERATION

In June 2018, the Commission published a proposal for a Regulation ‘establishing the space programme of the Union and the European Union Agency for the Space Programme’.⁴² Under this Regulation, the Commission has proposed to:

- a* increase its space budget to support the competitiveness and innovation capacity of the European sector;
- b* create an EU Agency for the Space Programme to replace the GSA; and
- c* to bring all of the major EU-led space programmes – Galileo, EGNOS, Copernicus and EUSST – under the control of a single body.

This has created some political sensitivity in the relationship between ESA and the EU as the proposed EU Space Agency is likely to overlap with ESA’s competencies owing to the number of mutual Member States of both bodies.

⁴² <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018PC0447&from=EN>.

INTERNATIONAL TELECOMMUNICATION UNION

Joanne Wheeler MBE and Vicky Jeong¹

The use of satellites depends on the ability to receive and transmit data to and from the satellites and the Earth.

The International Telecommunication Union (ITU) as early as 1959 recognised the importance of the spectrum requirements of space research, and began preparing a structured approach to the needs of the space industry. Space, and the management of satellite spectrum, is now a major part of the responsibilities of the ITU.

I INTRODUCTION TO THE ITU AND ITS ROLE

The ITU is a specialised agency within the United Nations system of organisations where representatives from governments and the private sector coordinate global telecommunications networks and services, including satellite spectrum.

The instruments of the ITU are the Constitution, Convention and Administrative Regulations (of which the Radio Regulations are a part). Together these three instruments form an international treaty governing the use of the radio spectrum to which the signatory ITU Member States are bound.

These instruments contain the main principles and regulations governing the following major elements:

- a* frequency allocations to different categories of radiocommunication services;
- b* the rights and obligations of Member States in obtaining access to the spectrum and orbit resources; and
- c* international recognition of these rights by recording frequency assignments and, as appropriate, orbital positions used or intended to be used in the Master International Frequency Register (the Master Register).

Member States are each represented by their national administration, which is the government department or service responsible for discharging the obligations set out in the ITU instruments and adopting appropriate national legislation to implement these obligations.

¹ Joanne Wheeler MBE is the managing partner and Vicky Jeong is an associate at Alden Legal Limited.

II RADIO FREQUENCY SPECTRUM AND THE GEOSTATIONARY ORBIT

The position in outer space, or orbital slot, occupied by a satellite determines the area of the Earth that its signals can reach (its footprint) and its orbit will determine whether it remains over the same area as the Earth rotates.

Certain orbital locations are in short supply. Most communications satellites operate in the geostationary-satellite orbit (GSO), which is at an altitude of 35,800km in the plane of the equator. The importance of this orbit is that at this altitude, each satellite rotates around the Earth's axis every 24 hours and so appears to be stationary above a fixed point on the Earth. The GSO represents a scarce natural resource, as does the radio-frequency spectrum.

The role of the ITU Member States in relation to the regulation of the radio-frequency spectrum and orbital positions, such as positions in the GSO, is set out in Article 44 Paragraph 2 (CS 196) of the Constitution of the ITU and reiterated in No. 0.3 of the Radio Regulations. The latter states that:

In using frequency bands for radio services, Members shall bear in mind that radio frequencies and the geostationary-satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of these Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries.

Two mechanisms for the sharing of orbit and spectrum resources have been developed and implemented:

- a* a priori planning procedures that guarantee equitable access to orbit and spectrum resources for future use; and
- b* coordination procedures.

In relation to point (b), the coordination procedure is an obligatory process of negotiation between national administrations, with the aim of achieving the efficient use of the orbit and spectrum resource through a controlled interference environment in which satellite networks can operate and meet requirements that include GSO networks in all services and frequency bands (which include the target satellites) and non-GSO networks in certain frequency bands.

III INTRODUCTION TO FREQUENCY ALLOCATION AND COORDINATION

Two important areas of ITU regulatory involvement with regard to satellites are:

- a* frequency allocations (Article 5 of the Radio Regulations); and
- b* the coordination, notification and recording in the Master Register (Articles 9 and 11 of the Radio Regulations).

Section IV of Article 5 of the Radio Regulations provides the Table of Frequency Allocations (the Table). The Table sets out, frequency band by frequency band, which radiocommunication services have allocations in each of the three ITU Regions.²

² The world is divided into three regions for ITU purposes.

Each ITU Member State may deviate from the Table in their own national Frequency Allocation Table, but only to the extent that harmful interference is not caused to any other ITU Member State that is using the spectrum in accordance with Article 5 of the Radio Regulations.

No. 4.2 of the Radio Regulations states:

Member States undertake that in assigning frequencies to stations which are capable of causing harmful interference to the services rendered by the stations of another country, such assignments are to be made in accordance with the Table and other provisions of these Regulations.

No. 4.4 continues by stating that:

Administrations of the Member States shall not assign to a station any frequency in derogation of either the Table in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations.

The Radio Regulations define those uses for specific frequency bands that will have international recognition in each of the three Regions. Within each frequency band, radiocommunication services are allocated on the basis of ‘primary’ and ‘secondary’ services, either on a worldwide or regional basis. By definition, stations of a secondary service must neither cause harmful interference to, nor claim protection from harmful interference caused by, existing or future stations of the primary service (No. 5.30 of the Radio Regulations).

In many instances, bands of frequencies are allocated to more than one service on a co-primary basis. In such cases, specific sharing conditions are imposed on each service, for example limitations on equivalent isotropically radiated power, minimum elevation angles for Earth stations and maximum levels of interference.

IV SIGNIFICANCE OF RECORDING IN THE MASTER REGISTER

The articles of the Radio Regulations contain procedures by which a satellite network’s frequency assignments can be registered, through its national administration, with the ITU to obtain international recognition. This means that all national administrations are informed of the use of the assignments and that they are taken into account in any future planning conducted at the national, regional or international level.

No. 8.1 of the Radio Regulations states that the: ‘international rights and obligations of administrations in respect of their own and other administrations’ frequency assignments shall be derived from the recording of those assignments in the Master Register or from their conformity, where appropriate, with a plan.’

The international rights are subject to the provisions of the Radio Regulations and those of any relevant frequency allotment or assignment plan. Recording in the Master Register offers the holder of the filings international recognition and protection of the right to use the spectrum without interference.

The Radio Regulations contain provisions leading to the recording of assignments in the Master Register for space services for bands that are either covered by a plan or that are accessible on a first come, first served basis.

An assignment in a non-planned band results from an application or filing by an operator through its national administration, such as the Office of Communications in the United Kingdom or the Federal Communications Commission in the United States, for a frequency assignment in a given band, with a specific coverage (or footprint) and a particular orbital position. Such filings are, in general, made on a first come, first served basis.

V ITU REQUIREMENTS AND PROCESSES FOR REGISTRATION IN THE MASTER REGISTER

i Advance publication information

Section II of Article 9 of the Radio Regulations describes the procedure for effecting coordination applicable to a satellite network. For those satellite networks not subject to such a procedure, the first stage of the regulatory process is the submission by a national administration to the ITU Radiocommunication Bureau (ITU-BR) of a general description of the network for advance publication in the International Frequency Information Circular. This stage is called the advance publication information (API).

For those satellite networks not subject to the coordination procedure described in Section II of Article 9 of the Radio Regulations, the date of receipt by the ITU of the API marks the start of their regulatory period. Currently, these networks are required to be brought into use within seven years of the date of receipt by the ITU of the API. The API must be supplied no earlier than seven years and preferably no later than two years before the planned date of bringing into use of the network.

Since 1 July 2016, it has not been necessary to submit the API for satellite networks subject to the coordination procedure, as described in Section II of Article 9 of the Radio Regulations. This was agreed among the Member States of the ITU and benefits operators, as it simplifies the notification procedure described in subsection iii, below.

ii Request for coordination

For those satellite networks subject to the coordination procedure described in Section II of Article 9 of the Radio Regulations, the first stage of the regulatory process is the submission of the complete information by a national administration to the ITU-BR. The date of receipt by the ITU of this information marks the start of the regulatory period. Currently, these networks are required to be brought into use within seven years of the date of receipt by the ITU of this information.

Before an administration can notify the ITU-BR or bring into use a frequency assignment it must effect coordination with other administrations identified as affected administrations. Coordination is a formal regulatory obligation both for an administration seeking a frequency assignment for its network and for an administration whose existing or planned services may be affected by that assignment. An agreement arising from coordination confers certain rights and imposes certain obligations on the administrations that are parties to that agreement.

Receipt by the ITU-BR of a request for coordination establishes the regulatory precedence of the network. Networks whose request for coordination was received by the ITU-BR after the prior request are deemed to have lower regulatory precedence to, and must seek a coordination agreement with, those networks with higher regulatory precedence (i.e., the networks where the relevant request for coordination was received earlier and that are affected by the later network).

Assignments are recognised by prior networks by virtue of the coordination agreements that have been entered into. If coordination is not complete against any assignments with which it was required, then the network operator cannot claim protection from harmful interference from, and must remove any harmful interference caused to, the prior networks. In other words, it must operate on a non-interference, non-protection basis in respect of those assignments.

iii Notification

The notification of a frequency assignment to the ITU-BR in accordance with Article 11 of the Radio Regulations is the final regulatory step leading to the recording of the frequency assignment in the Master Register. The provisions relating to notification of frequency assignments are primarily set out in Article 11 of the Radio Regulations, except for certain services that affect or that are related to the planned assignments. In general, all assignments related to space services need to be notified.

The Master Register provides, in addition to the basic characteristics of the assignment, an indication of each assignment's status with respect to the other assignments, reflecting the findings issued at the time when it was recorded in the Master Register.

iv Regulatory requirements for recording in the Master Register

The status given to each assignment recorded in the Master Register derives from the successful application of the relevant coordination procedures and the resulting coordination agreements. However, the status is conditional on:

- a* the assignment being brought into use (i.e., used for at least 90 days) within a defined regulatory time limit;
- b* notification information; and
- c* due diligence information,³ where applicable, being submitted within the defined regulatory time limit.

v World radio conferences

The specific procedures setting out the rights and obligations of each administration in relation to orbit and spectrum management and providing the means to achieve radiocommunication in a controlled interference environment have been laid down by successive ITU world radio conferences (WRCs) based on two main principles: efficient use and equitable access.

WRCS are held approximately every three to four years, and have the power to amend the Radio Regulations according to specific agenda items that are identified by the preceding WRC.

3 Resolution 49 (Rev.WRC-07) – Administrative due diligence.

INTERNATIONAL TREATIES

Joanne Wheeler MBE and Vicky Jeong¹

I INTRODUCTION

The world's first satellite, Sputnik 1, was launched by the former Soviet Union (now Russia) on 4 October 1957. On 6 April 1965, the United States placed the first geostationary satellite, Intelsat 1, in orbit. From these early steps we now have a significant number of (peaceful civilian) commercial uses of outer space, including: broadcasting; telecommunications (fixed, land and maritime mobile satellite services); navigation, including the global positioning system and the global navigation satellite system; Earth observation; and meteorology. The military also make extensive use of outer space. Today, initiatives such as government satellite communications illustrate that space is increasingly used for the provision of both governmental and commercial satellite services for security purposes and governmental applications.

Satellites are by their nature extraterrestrial and extraterritorial. Accordingly, their usage is governed by an extensive international legal framework, under the aegis of the United Nations, made up of treaties, agreements and conventions governed by international law, which may be implemented into national law.

Apart from the obvious concerns about the 'peaceful uses' of outer space, the legal framework governing the use of satellites is grounded in the allocation of orbital positions for satellites, the related radio-frequency spectrum to enable communication to and from the satellites, and the related frequencies for terrestrial use of those communications. In relation to orbital positions, satellites in geostationary orbits are in 'fixed' positions approximately 36,000 kilometres above Earth, and satellites in medium and low orbits operate at lower altitudes.

To enable 'fair and equitable' use of the finite space closely surrounding Earth, coordination of these positions is based on the need for satellites not to interfere with each other physically, which is important with regard to the radio frequency spectrum (also finite, although some prefer to say 'scarce') used by satellites so as to prevent 'harmful interference' between the services using different spectrum.

The allocation and coordination of spectrum and orbital slots is dealt with separately in Chapter 2 on the International Telecommunication Union.

II UN SPACE TREATIES

During the Cold War period, there was an increasing emphasis on the development of national military capabilities, especially in the Soviet Union and the United States, and the building of intercontinental ballistic missiles using rocket technology. The launch of Sputnik 1 was the

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catalyst for the space race between these countries, and the concern that outer space could be used for military purposes. This led to the recognition by the international community of the need to put in place a minimal framework for the use of outer space for peaceful purposes.

Following resolutions passed in 1961 and 1962 concerning the peaceful uses of outer space, and a subsequent declaration setting out the principles governing the activities of states in outer space, five treaties were concluded by the United Nations through its Committee on the Peaceful Uses of Outer Space (COPUOS), which was established in 1959, and now form part of the corpus of international law governing outer space:

- a* the 1967 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty);
- b* the 1968 Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (the Rescue and Return Agreement);
- c* the 1972 Convention on International Liability for Damage Caused by Space Objects (the Liability Convention);
- d* the 1974 Convention on Registration of Objects Launched into Outer Space (the Registration Convention); and
- e* the 1979 Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the Moon Agreement).

The UN space treaties establish rights and obligations between states parties to the treaties (the States Parties), which bear international responsibility for activities carried out by governmental entities, such as national space agencies, as well as commercial entities such as launch service providers, satellite operators, participants in outer space activities and entities conducting other activities in outer space.

The UN space treaties do not directly create obligations on non-governmental entities and it is at the discretion of States Parties to flow some of the obligations under the UN space treaties, such as responsibility and liability in case of damages, down to private commercial parties through the adoption of national space legislation or licensing regimes.

At the international level, four of the five UN space treaties have been widely ratified.² The exception is the Moon Agreement³ for the reasons discussed in subsection v. States with launch service capability or with an established national space industry, or both, have ratified the four space treaties.

i Outer Space Treaty

The Outer Space Treaty establishes fundamental rules and principles that govern the exploration and use of outer space. The preamble of the Outer Space Treaty recognises the

² As at 1 January 2019, 109 states have ratified, accepted or approved accession or succession to the Outer Space Treaty and 23 states have signed the Outer Space Treaty; 96 states have ratified, accepted or approved accession or succession to the Liability Convention and 19 states have signed the Liability Convention; 69 states have ratified, accepted or approved accession or succession to the Registration Convention and three states have signed the Registration Convention; and 98 states have ratified, accepted or approved accession or succession to the Rescue and Return Agreement and 23 states have signed the Rescue and Return Agreement.

³ As at 1 January 2019, 18 states have ratified, accepted or approved accession or succession to the Moon Agreement and four states have signed the Moon Agreement.

‘common interest of all mankind in the progress of the exploration and use of outer space’⁴ and sets out that activities should be carried out ‘for the benefit of all peoples irrespective of the degree of their economic or scientific development’⁵ to ‘contribute to broad international cooperation’⁶ that can lead to ‘the development of mutual understanding and to the strengthening of friendly relations between States and peoples’.⁷

The States Parties to the Outer Space Treaty must comply with the key principles set out in it:

- a* that outer space, including the Moon and other celestial bodies, shall be ‘for the province of all mankind’;⁸
- b* that the use of outer space, including the Moon and other celestial bodies, shall be ‘without discrimination of any kind’;⁹
- c* that outer space, including the Moon and other celestial bodies, are not subject to appropriation;¹⁰
- d* that activities in outer space are to be carried out in accordance with international law;¹¹
- e* that outer space will be used for peaceful purposes, banning the establishment of military bases and installation and the testing of weapons;¹²
- f* that States Parties have international responsibility for national activities carried out by both governmental and non-governmental entities and the obligation to authorise and continuously supervise national activities;¹³
- g* that there is international liability for damage caused by a State Party that ‘launches or procures the launching of an object into outer space’¹⁴ (the Launching State);
- h* that a State Party will have jurisdiction and control over a space object that it registers on its national registry;¹⁵
- i* the principle of cooperation and mutual assistance and the obligation on a State Party to carry out activities with ‘due regard to the corresponding interests of all other States Parties’;¹⁶ and
- j* that activities must not lead to the harmful contamination of outer space or to the environment of the Earth that may result from the ‘introduction of extraterrestrial matter’.¹⁷

ii Liability Convention

The Liability Convention expands on Article VII of the Outer Space Treaty and introduces definitions for ‘space object’, ‘launching’, ‘launching State’ and ‘damage’.

4 Preamble of the Outer Space Treaty.

5 *ibid.*

6 *ibid.*

7 *ibid.*

8 Article I of the Outer Space Treaty.

9 *ibid.*

10 Article II of the Outer Space Treaty.

11 Article III of the Outer Space Treaty.

12 Article IV of the Outer Space Treaty.

13 Article VI of the Outer Space Treaty.

14 Article VII of the Outer Space Treaty.

15 Article VIII of the Outer Space Treaty.

16 Article IX of the Outer Space Treaty.

17 Article IX of the Outer Space Treaty.

Articles II and III of the Liability Convention establish two concepts of liability:

- a* absolute (strict) liability for damage ‘on the surface of the Earth or to aircraft in flight’; and
- b* fault-based liability for damage caused ‘elsewhere than on the surface of the Earth’.

Liability is imposed on the Launching State of a space object that causes damage. There can be several Launching States. Under Article 1(c) of the Liability Convention, a Launching State includes a state:

- a* that launches a space object;
- b* that procures the launching of a space object;
- c* from whose territory a space object is launched; and
- d* from whose facility a space object is launched.

Article V establishes joint and several liability for any damage caused by a space object launched by two or more states.

Dispute resolution under the Liability Convention, its practicalities and alternatives

The definition of ‘damage’ under Article I(a) of the Liability Convention only extends to physical damage and it is unclear if compensation for damage under Article XII of the Liability Convention extends to indirect damage, such as loss of commercial revenues. The concept of ‘fault’ under Article III of the Liability Convention is also difficult to prove when damage occurs elsewhere than on the surface of the Earth.

In terms of the dispute resolution procedure set forth under the Liability Convention, a claim for compensation for damage must first be presented through diplomatic channels or through the UN Secretary-General.¹⁸ However, there is no requirement for the prior exhaustion of domestic remedies.¹⁹

Pursuant to the Liability Convention, if the relevant State Party (of the nation experiencing damage) does not present a claim for damage, another State Party may present a claim in respect of damage sustained in its territory by a person.²⁰ Should neither the state of nationality nor the state where the damage occurred present a claim, then the state of permanent residence of the damaged person or entity may present a claim.²¹ This will all be subject to the condition that the injury or damage is not to a national of the Launching State or to someone who is operating the space object.²²

The statute of limitations for bringing a claim is one year following the date of the occurrence of the damage or the identification of the liable Launching State.²³ If a settlement of the claim cannot be achieved through diplomatic negotiations within a year, the concerned States Parties are required to establish a Claims Commission,²⁴ which will make its decision and determine the amount of compensation payable based on the merits of the claim.²⁵

18 Article IX of the Liability Convention.

19 Article XI of the Liability Convention.

20 Article VIII(2) of the Liability Convention.

21 Article VIII(3) of the Liability Convention.

22 Article VII of the Liability Convention.

23 Article X(1) of the Liability Convention.

24 Article XIV of the Liability Convention.

25 Article XVIII of the Liability Convention.

However, the Claims Commission's decision is only final and binding 'if the parties have so agreed'; otherwise, it will render a final and recommendatory award that the parties are required to 'consider in good faith'.²⁶

An alternative is for a UN Member State to bring the case before the International Court of Justice (ICJ). However, this requires the exhaustion of all local remedies and the ICJ's adjudication power is restricted unless the states (both claimant and defendant states) accept the jurisdiction of the ICJ.

Another alternative is to bring the case before the Permanent Court of Arbitration (PCA) and rely on the Optional Rules for Arbitration of Disputes Relating to Outer Space Activities (the PCA Space Rules).²⁷ This allows the claiming parties to choose the size of the arbitration panel,²⁸ invoke confidentiality²⁹ and designate the law or rules of law applicable to the substance of the dispute.³⁰ Most importantly, the PCA Space Rules can be relied on not only by states and IGOs but also private entities. Another distinguishing factor is that the awards under the PCA Space Rules are final and binding.³¹

To date, there have been no cases before an international tribunal on international space law.

iii Registration Convention

The Registration Convention obliges a Launching State (as defined in the Liability Convention) to register a space object in 'an appropriate registry which it shall maintain'. This refers to an appropriate national registry,³² which should be established by the Launching State. The relevant Launching State is obliged to supply the UN Secretary-General with information concerning the space object 'as soon as practicable'.³³ Where there is more than one Launching State, the states are required to 'jointly determine' which one of them is to register the space object.³⁴ The state that registers the space object in its registry shall retain jurisdiction and control over the object in accordance with Article VIII of the Outer Space Treaty.

Transfer of space objects

Neither the Registration Convention nor any other UN space treaty provides for the transfer of a space object from the national registry of one state to the national registry of another state. This may be required, for example, in relation to the acquisition of an object or the merger or acquisition of a company. Such transfers must therefore, where possible, be dealt with through bilateral or multilateral agreements of the states concerned.

26 Article XIX(2) of the Liability Convention.

27 Optional Rules for Arbitration of Disputes Relating to Outer Space Activities, Effective 6 December 2011, pca-cpa.org.

28 Articles 5 to 10 of the PCA Space Rules.

29 Article 17(6) of the PCA Space Rules.

30 Article 35(1) of the PCA Space Rules.

31 Articles 34(2) and 38 of the PCA Space Rules.

32 Article II(1) of the Registration Convention.

33 Article IV of the Registration Convention.

34 Article II(2) of the Registration Convention.

iv Rescue and Return Agreement

During the Cold War, the Soviet Union and the United States identified the need for a humanitarian framework to deal with the return of astronauts to their domicile and attempt to deal with the fear of mistreatment or hostage keeping. This led to the Rescue and Return Agreement, which sets out duties for States Parties to assist one another in the rescue and return of astronauts as well as space objects.

The Outer Space Treaty provides astronauts with a special status as ‘envoys of mankind’³⁵ and they are to be given ‘all possible assistance in the event of accident, distress, or emergency landing’.³⁶ The Rescue and Return Agreement departs from the notion of envoys of mankind and instead refers to ‘personnel of spacecraft’.

Under the Rescue and Return Agreement, a State Party is required to:

- a* immediately notify the relevant Launching State and the UN Secretary-General when it becomes aware of personnel of a spacecraft who have suffered an accident, are experiencing conditions of distress or who have made an emergency or unintended landing under its jurisdiction or on the high seas;³⁷ and
- b* immediately take possible steps to rescue such personnel and render all necessary assistance.³⁸

The Rescue and Return Agreement also mandates the return of space objects to the relevant Launching State. State Parties to the Rescue and Return Agreement have an obligation to notify the Launching State of the space object when they discover any space objects or their component parts that have returned to the Earth.³⁹ On the request of the Launching State of the space object, the State Party having jurisdiction over the territory on which the space object has been discovered is required to ‘take such steps as it finds practicable to recover the object’;⁴⁰ return or hold the space object at the disposal of representatives of the Launching State, which shall furnish identifying data prior to its return;⁴¹ and eliminate the possible danger of harm.⁴² The expenses incurred in recovering and returning a space object are to be borne by the Launching State.

As at April 2018, the total number of recovered space objects notified to the UN Secretary-General was around 140 objects and around 4,000 small particles.⁴³

35 Article V of the Outer Space Treaty.

36 *ibid.*

37 Article 1 of the Rescue and Return Agreement.

38 Article 2 of the Rescue and Return Agreement.

39 Article 5(1) of the Rescue and Return Agreement.

40 Article 5(2) of the Rescue and Return Agreement.

41 Article 5(3) of the Rescue and Return Agreement.

42 Article 5(4) of the Rescue and Return Agreement.

43 Information furnished during the IISL/ECSL Symposium on ‘the 50th Anniversary of the Rescue and Return Agreement: Relevance and Challenges’ on 9 April 2018: <https://www.unoosa.org/documents/pdf/copuos/lsc/2018/symp-02.pdf>.

v Moon Agreement

Article II of the Outer Space Treaty sets out the principle of non-appropriation, which states that ‘outer space, including the Moon and other celestial bodies, is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means’.⁴⁴ This is repeated in Article 11(2) of the Moon Agreement.

The Moon Agreement, however, creates legal uncertainty by introducing a framework for the exploitation of the natural resources of the Moon and other celestial bodies as it is not clear whether the prohibition under Article II of the Outer Space Treaty extends to the appropriation of resources contained within celestial bodies (i.e., which can be extracted).

What distinguishes the Moon Agreement from the other four UN space treaties is that it introduces the concept that the Moon and its natural resources are the ‘common heritage of mankind’,⁴⁵ which is a principle that originates from the 1982 UN Convention on the Law of the Sea in relation to the exploitation of mineral resources in the deep seabed.

The Moon Agreement also sets forth that States Parties are to establish an international regime to govern the exploitation of the natural resources of the Moon and other celestial bodies when ‘such exploitation is about to become feasible’.⁴⁶ Pursuant to Article 11(7) of the Moon Agreement, the main purposes of this international regime to be established shall include:

- a* the ‘orderly and safe development of the natural resources of the Moon’;⁴⁷
- b* the ‘rational management of those resources’;⁴⁸
- c* the ‘expansion of opportunities in the use of those resources’;⁴⁹ and
- d* an ‘equitable sharing by all States Parties in the benefits derived from those resources, whereby interests and needs of the developing countries, as well as the efforts of those countries which have contributed either directly or indirectly to the exploration of the Moon, shall be given special consideration’.⁵⁰

Many states see the notion of equitable sharing under Article 11(7)(d) of the Moon Agreement as a hindrance to the exploitation of natural resources of the Moon and other celestial bodies. As a consequence, the Moon Agreement, unlike the other UN space treaties, has not been widely adopted by states and, to date, has not been signed or ratified by any of the major spacefaring nations such as the United States, China or Russia.

III PRINCIPLES ADOPTED BY THE GENERAL ASSEMBLY

In addition to the UN space treaties noted in Section II, the UN General Assembly has adopted a series of declarations and principles relating to the exploration and use of outer space, namely the:

- a* Declaration of Legal Principles Governing the Activities of States in the Exploration and Uses of Outer Space 1963;

44 Article II of the Outer Space Treaty.

45 Article 11(1) of the Moon Agreement.

46 Article 11(5) of the Moon Agreement.

47 Article 11(7)(a) of the Moon Agreement.

48 Article 11(7)(b) of the Moon Agreement.

49 Article 11(7)(c) of the Moon Agreement.

50 Article 11(7)(d) of the Moon Agreement.

- b* Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting 1982;
- c* Principles Relating to Remote Sensing of the Earth from Outer Space 1986 (the Remote Sensing Principles);
- d* Principles Relevant to the Use of Nuclear Power Sources in Outer Space 1992; and
- e* Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries 1996.

The principles adopted by the General Assembly reflect and supplement those set out in the UN space treaties. Common themes include the need to conduct activities in and relating to outer space in the interests of all states, the need to act in accordance with international law, the importance of cooperation and mutual assistance, and the international responsibility of states for their national activities in and relating to outer space.

The Remote Sensing Principles are particularly significant given the rise of commercial Earth observation satellite activities, including the commercialised distribution of Earth observation data. The Remote Sensing Principles create important distinctions between primary data (raw data acquired by remote sensors and transmitted to the Earth from space), processed data (results of the processing of primary data into a usable form) and analysed information (information resulting from the interpretation of processed data). These distinctions have been adopted by regulatory bodies in their laws and policies relating to the ownership of Earth observation data.

IV INTERNATIONAL SPACE STATION

There are other agreements between states that govern more specific issues such as activities on the International Space Station (ISS).

- The following specific instruments govern the conduct of astronauts on board the ISS:
- a* an Intergovernmental Agreement concerning cooperation on the civil International Space Station between the governments of Canada, Japan, Russia, USA and the Member States of the European Space Agency 1998 (the ISS Agreement);
 - b* four memoranda of understanding between NASA and (1) the Canadian Space Agency, (2) the European Space Agency, (3) the government of Japan and (4) the Russian Space Agency (the ISS MOUs); and
 - c* the Code of Conduct for the International Space Station Crew (CCOC).

The ISS MOUs sets out that each Partner State must approve the CCOC before it provides space station crew. The CCOC establishes a chain of command on-orbit, a clear relationship between ground and on-orbit management, management hierarchy, standards for work and activities in space, and disciplinary regulations. It also provides the Space Station Commander with appropriate authority and responsibility.

According to the ISS MOUs, the crew operates as one integrated team with one ISS Commander, who is responsible for the mission programme implementation and crew safety assurance on board the ISS.

Crew disciplinary policy is developed by the Multilateral Crew Operations Panel, which also has the power to address violations of the CCOC and impose disciplinary measures. This

policy applies to any person approved for flight to the ISS, including both expedition crew and visiting crew, from the moment each is assigned a specific mission until the post-flight activities related to the mission is completed.

The ISS Commander is the highest authority among the ISS crew members on-orbit. The ISS Commander is in charge of on-orbit management and the flight director is in charge of ground management. The ISS Commander works under the direction of the flight director and in accordance with the flight rules. However, the ISS Commander is entitled to change the daily routine of the ISS crew members to address contingencies, perform urgent work associated with crew safety and the protection of ISS elements or conduct critical flight operations. Otherwise, the ISS Commander should implement the mission as directed by the flight director.

V FUTURE OF THE UN SPACE TREATIES

Although many countries recognise the need to update the UN space treaties to reflect emerging innovative activities such as space debris removal, in-orbit servicing and space resources utilisation, decision-making in COPUOS requires consensus among all Member States. As at 2018, there are 92 members of COPUOS,⁵¹ which means that harmonised understanding is hard to achieve in the subcommittee meetings. It is therefore unlikely that another treaty will be drafted and negotiated in the near future, or that the current UN space treaties will be updated.

However, guidelines on the long-term sustainability of outer space activities have recently been developed during COPUOS subcommittee meetings.

51 <https://www.unoosa.org/oosa/en/ourwork/copuos/members/evolution.html>.

AUSTRALIA

*Thomas Jones and Tom Macken*¹

I INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

i Overview of the space industry

Australia has a long and distinguished history as a space-faring nation. Its origins trace back to the middle of the twentieth century when a test launch facility was established in Woomera, South Australia in 1949.² This facility was the base for the launch of the Weapon Research Establishment Satellite (WRESAT 1) in 1967, which was the third launch of its kind to have been successfully completed by any country (following the Soviet Union and the United States).³ Australia was providing launch services to various European countries during this period through its membership of the European Launcher Development Organisation⁴ and was also managing a number of NASA tracking stations, which provided important orbital satellite, space-flight and deep-space tracking network services to the United States' national space agency.⁵ This information was central to the United States' space exploration initiatives, including the Apollo 11 expedition and the Moon landing. Australia's vast land mass and its relative proximity to the equator were well suited to support these early launch activities (and remain a significant advantage).

As well as providing operational and launch services, Australia was also involved in the global space political and regulatory sphere. The strength of its relationship with the United States and the United Kingdom helped it to play an important role in the development of the international legal framework for outer space. It joined as a foundation member of the United Nations Committee on the Peaceful Uses of Outer Space⁶ and was a signatory to the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer

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2 Kerrie A Dougherty, *Australia in Space: A History of a Nation's Involvement* (ATF Press, 2017), 12.

3 Cheryl Jones, 'Watch This Empty Space', *The Australian* (31 March 2010), cited in Steven Freeland, 'Australia and International Space Law' in Donald R Rothwell and Emily Crawford (eds), *International Law in Australia* (Thomson Reuters, 2017), 507.

4 Steven Freeland, 'Australia and International Space Law' in Donald R Rothwell and Emily Crawford (eds), *International Law in Australia* (Thomson Reuters, 2017), 508.

5 Dougherty, above n 2, 51.

6 Freeland, above n 4, 508.

Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty) when that treaty entered into force in 1967. It is now one of only 17 states that are signatories to all five of the United Nations (UN) space treaties (see subsection ii).⁷

Despite Australia's promising entry onto the global space stage during the mid-twentieth century, the development of its domestic space industry was hampered from the 1970s onwards because of the 'cycles of engagement and retreat from space activities' that characterised the approach of successive Australian governments.⁸ They failed to grasp the need for, and importance of, formulating any sort of national space policy or promoting a unified national space effort.⁹

This, coupled with a slowdown in the global space race during the 1970s and 1980s and a decline in the British and Australian weapons programmes during this period, left Australia as one of only two member countries of the Organisation for Economic Co-operation and Development without a national space agency and without any form of a targeted space activities domestic legislative framework.

However, things began to change in the 1990s. The development of the global space industry, and the opportunities for commercial launch services to be provided from Australia (which were being actively explored by several overseas companies), prompted the government to reconsider Australia's future role in space.¹⁰ By this time, the concept of space as the exclusive domain of government was being replaced by one that viewed space as an opportunity for commercial exploitation. This was, in large part, driven by the growth in the number of opportunities being presented by satellite-based communications and applications.

As a consequence of this evolving perception, and growing demand for a launch industry in Australia,¹¹ the government introduced legislation that regulated the conduct of space activities on Australian soil. This led to the passing of the Space Activities Act 1998 (Cth) and, later, the Space Activities Regulations 2001 (Cth). In doing so, Australia became only the sixth country in the world to introduce a targeted space activities framework.¹²

ii Regulation

As stated in the explanatory memorandum to the Space Activities Bill 1998 (Cth), the Space Activities Act was introduced to 'reflect in Australian law, Australia's obligations as a signatory to the key United Nations space treaties and to provide a legally certain and predictable environment for the development and operation of Australia's space launch facilities'.¹³

The objects of the Space Activities Act¹⁴ included:

- a* establishing a system for the regulation of space activities carried on either from Australia or by Australian nationals outside Australia;
- b* providing for the payment of adequate compensation for damage caused to persons or property as a result of space activities regulated by this Act; and

7 United Nations Committee on the Peaceful Uses of Outer Space Legal Subcommittee, Status of international agreements relating to activities in outer space as at 1 January 2019, 58th session, UN Doc A/AC.105/C.2/2019/CRP.3 (1 July 2019).

8 Dougherty, above n 2, 139.

9 *ibid.*, 164.

10 Freeland, above n 4, 513.

11 *ibid.*, 514.

12 *ibid.*

13 Explanatory memorandum, Space Activities Bill 1998 (Cth), 4.

14 Space Activities Act 1998 (Cth), s 3.

- c implementing certain of Australia's obligations under the UN space treaties and specified space cooperation agreements.

The third of these objects (point (c), above) related to the international obligations that arise under the five UN treaties to which Australia is a signatory. These treaties include:

- a the Outer Space Treaty;
- b the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched in the Outer Space (1968);
- c the Convention on International Liability for Damage Caused by Space Objects (1972) (the Liability Convention);
- d the Convention on Registration of Objects Launched into Outer Space (1975) (the Registration Convention); and
- e the Agreement Governing the Activities of States on the Moon and other Celestial Bodies (1979).

To ratify these treaties and give them legislative force (which can only be done through an act of the legislature or judiciary under the Constitution of Australia), each of these five treaties was annexed as a Schedule to the Space Activities Act.

The Space Activities Regulations contained details regarding the process, approval and licensing requirements for the following types of space activities contemplated by the Space Activities Act: (1) the operation of a launch facility in Australia; (2) the launch of a space object in Australia; (3) the launch of an Australian space object from a facility located outside Australia; and (4) the return of a space object to a place anywhere in Australia.

Reform of the Space Activities Act and Space Activities Regulations

In October 2015, the government commenced a comprehensive review of Australia's space industry capability (the Space Industry Review), including the Space Activities Act, in light of the dramatic advancements in space-related technologies and applications since the introduction of the legislative framework in 1998. The review considered whether the existing legislative regime struck the appropriate balance between promoting investment and innovation in the domestic space industry, and ensuring Australia met its international obligations for the use of space, including in relation to the mitigation of risk to itself and other nations.

Following extensive public consultation with government, non-government and international stakeholders, legislative proposals were released that proposed significant reforms. Following the consideration of feedback from industry on these reforms, the Space Activities Amendment (Launches and Returns) Bill 2018 (Cth) (the Bill) was introduced into Parliament in June 2018. It sought to amend the Space Activities Act by:

- a broadening the regulatory framework to include arrangements for launches from aircraft in flight and launches of high-power rockets;
- b reducing the barriers to participation in the space industry by streamlining approval processes and insurance requirements for launches and return;
- c introducing safeguards for high-power rocket activities; and
- d increasing non-compliance penalties for damage to people and property.

In August 2018, the Bill passed both houses of Parliament without amendment and received Royal Assent on 31 August 2018. It commenced as the Space (Launches and Returns) Act 2018 (Cth) (the Launches and Returns Act) on 31 August 2019.

Subordinate legislation (the Rules) outlining the information that an applicant will need to provide for different licences and permits, as well as the relevant insurance requirements and conditions, also came into effect on the same date as the Launches and Returns Act.¹⁵ The Space Activities Regulations were repealed upon the commencement of these Rules.

A summary of the operation of this amended regulatory framework, including the Launches and Returns Act and the Rules, is included in Section II.

iii Establishment of the Australian Space Agency

As one of the key pillars of the government's response to the Space Industry Review, it was decided that a national space agency should be established to guide and oversee the growth of Australia's space industry to A\$10–12 billion by 2030.

As a result, the Australian Space Agency (ASA) was formally established on 1 July 2018. It is a non-statutory and whole-of-government entity located within the Department of Industry, Innovation and Science.

The ASA, led by Dr Megan Clark,¹⁶ is vested with the responsibility to transform and grow a globally respected space industry in Australia, by: (1) coordinating and promoting Australia's domestic space sector activities; (2) supporting the growth of Australia's space industry through the promotion of increased industry opportunities; and (3) leading Australia's engagement with other international space agencies and industry players.

The ASA Charter contains a detailed summary of the ASA's purpose, responsibilities and governance structure. A summary of some of the ASA's recent, and ongoing, initiatives is provided in Section IV.

II REGULATION IN PRACTICE

i Licence requirements and application process

Engaging in space activities requires licences, permits and authorisations under the Launches and Returns Act.

15 The Rules are made up of three sets of rules, including the: (1) Space (Launches and Returns) (General) Rules 2019; (2) Space (Launches and Returns) (High Power Rocket) Rules 2019; and (3) Space (Launches and Returns) (Insurance) Rules 2019.

16 Dr Megan Clark AC is a geologist with a BSc (Hons) in geology from the University of Western Australia, Perth, Australia and a PhD in economic geology from Queen's University, Canada. She was previously the chief executive officer of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and has held executive positions at a number of large organisations, including Rio Tinto and BHP Billiton.

Launch facility licence

A launch facility licence is required if a person intends to operate a launch facility¹⁷ in Australia. Importantly, this licence is only required if the objects to be launched are space objects (i.e., those that are being launched to a height that is greater than 100km above mean sea level).¹⁸

To obtain a launch facility licence, an applicant must satisfy the relevant Minister (the Minister) that it:¹⁹

- a* is competent to operate a launch facility;
- b* has obtained all the necessary environmental approvals;
- c* has in place an adequate environmental plan for the construction and operation of the launch facility;
- d* has sufficient funding to construct and operate the launch facility;
- e* has, to the maximum extent reasonably practicable, minimised the risk of the construction and operation of the launch facility causing substantial harm to public health and safety or damage to property;
- f* does not pose a risk to Australia's security, defence or international relations; and
- g* has designed the launch facility to be as effective and safe as reasonably practicable having regard to its purpose.²⁰

The Rules set out the specific information that an applicant needs to provide to satisfy the Minister in relation to these criteria. This includes, for example, basic information about the applicant and the launch facility, facility management plans, organisational structure and personnel details, and technology security plans.²¹ These information requirements must be submitted at the prescribed stage of the application process (there are three stages).

There are also conditions attached to the granting of a launch facility licence. These require licensees to comply with certain record-keeping requirements, notify the Minister of certain changes to their organisational structure and personnel, and operate the facility in accordance with the Launches and Returns Act.²²

Penalties apply where a launch facility is operated without a licence or where a licensee breaches the conditions of its licence.

Launch permit

A launch permit is required if a person intends to launch one or more space objects from a launch facility in Australia, from an Australian aircraft or from a foreign aircraft that is in Australian airspace.²³ A permit can authorise a single launch or a particular series of

17 A 'launch facility' means a facility (whether fixed or mobile) or place specifically designed or constructed as a facility or place from which space objects can be launched, and includes all other facilities at the facility or place that are necessary to conduct a launch (Space (Launches and Returns) Act 2018 (Cth), s 8).

18 A 'space object' means (1) an object the whole or a part of which is to go into or come back from an area beyond a distance of 100km above mean sea level; or (2) any part of such an object, even if the part is to go only some of the way towards or back from an area beyond a distance of 100km above mean sea level (Space (Launches and Returns) Act 2018 (Cth), s 8).

19 Space (Launches and Returns) Act 2018 (Cth), s 18.

20 Space (Launches and Returns) (General) Rules 2019, r 5.

21 Space (Launches and Returns) (General) Rules 2019, rr 11–25.

22 Space (Launches and Returns) (General) Rules 2019, rr 7–9.

23 Space (Launches and Returns) Act 2018 (Cth), s 28.

launches depending on the nature of the payloads being carried.²⁴ The authorisation of multiple launches is a new feature of the Launches and Returns Act, which reflects the goal of promoting investment and innovation by making launches easier.

To obtain a launch permit, a person must satisfy the Minister on the same grounds of competency, risk mitigation, financial standing and national security that apply to launch facility licence applications.²⁵ In addition, the applicant must demonstrate that:²⁶

- a* it has satisfied the required insurance and financial requirements (see below);
- b* the space objects concerned are not, and do not, contain a nuclear weapon or a weapon of mass destruction;
- c* the launch vehicle to be used is as effective and safe as is reasonably practicable having regard to the purpose of the launch;
- d* the flight path for each launch is as effective and safe as is reasonably practicable;
- e* the risk-hazard analysis for each launch and connected return is compliant with the relevant flight safety code; and
- f* adequate planning has been carried out to address the environmental impact of the launch or launches and any connected return.

The Rules set out the specific information that an applicant needs to provide to satisfy the Minister in relation to the above criteria. These are broadly consistent with the information requirements that apply to launch facility licence applications but also include information about the launch, launch vehicle, flight path, flight history or testing, payload information, launch management plan, risk-hazard analysis, flight safety plan, debris mitigation strategy (discussed below) and contractual information.²⁷

Permit holders must provide the Minister with certain information relating to the launches at least two days prior to the launch (but not more than 10 days), including the date and time of the launch, the trajectory of the space object and any change to the payloads to be launched.²⁸

Significant penalties (including criminal sanctions) apply in circumstances where the holder of a launch permit breaches a key condition of the permit. These can be a fine of up to A\$21 million for a business, and a fine of A\$1.155 million or up to 10 years' imprisonment for an individual. A breach of the conditions relating to information requirements can attract a penalty of A\$210,000.

High-power rocket permit

A high-power rocket permit is required if a person intends to launch a high-power rocket from a facility or place (whether fixed or mobile) in Australia. The definition of a high-power rocket, as currently drafted, imports both an impulse and a complexity characteristic: it is one that is propelled by motors with a combined impulse greater than 889,600 Newton seconds or fitted with an active control system.²⁹ This term is not defined in the Launches and Returns Act, and the Rules do not provide any guidance on its proposed operation.

24 Space (Launches and Returns) Act 2018 (Cth), s 28(1).

25 Space (Launches and Returns) Act 2018 (Cth), s 28(3).

26 Space (Launches and Returns) (General) Rules 2019, r 35.

27 Space (Launches and Returns) (General) Rules 2019, rr 43–57.

28 Space (Launches and Returns) (General) Rules 2019, r 37.

29 Space (Launches and Returns) (High Power Rocket) Rules 2019, r 5.

To obtain a high-power rocket permit, a person must satisfy the Minister on the same grounds of competency, risk mitigation, insurance requirements, financial standing and national security that apply to launch permit applications. In addition, it must be demonstrated that the high-power rocket, and the flight path for the launch, is as effective and safe as is reasonably practicable.³⁰

The Rules set out the specific information that an applicant needs to provide to satisfy the Minister in relation to the above criteria. These are broadly consistent with the information requirements that apply to launch permit applications. In addition, applicants are required to provide information about the high-power rocket (including manufacturer details, technical specifications and quality assurance certification), as well as the history of the rocket.³¹

There are also conditions attached to the granting of a high-power rocket permit. These are similar to the conditions attached to launch permits, including the time, date and planned trajectory of any launches, any changes to the assumptions and data used in the risk-hazard analysis, the contents of the launch management plan or flight safety plan, and certain changes to the organisational structure or personnel.³²

Significant penalties apply in circumstances where a high-power rocket permit holder fails to comply with the public health and safety and insurance conditions of the permit. These can be up to a fine of up to A\$21 million for a business, and a fine of A\$1.155 million or up to 10 years' imprisonment for an individual. Breaches of the other permit conditions can attract a penalty of up to A\$210,000.

Overseas payload permit

An overseas payload permit is required if a person intends to launch one or more space objects from a facility (whether fixed or mobile), or a place, outside Australia using a specified launch vehicle. However, permits are only required if an Australian national is a responsible party³³ for the launch.

To obtain an overseas payload permit, a person must satisfy the Minister on similar grounds to those of the other licences and permits under the Launches and Returns Act. These include certain insurance and financial requirements (unless these are not required in the circumstances), risk mitigation and national security grounds, and proof provided by the applicant that the space objects concerned do not contain nuclear weapons or a nuclear power source (unless approval has been obtained). The Rules set out the specific information that an applicant needs to provide.

In some circumstances, applicants will be required to obtain an overseas payload permit in addition to another permit or licence. This would be the case, for example, when a person wishes to launch a payload from an Australian aircraft that is in transit overseas. In this

30 Space (Launches and Returns) (High Power Rocket) Rules 2019, r 6.

31 Space (Launches and Returns) (High Power Rocket) Rules 2019, rr 14–35.

32 Space (Launches and Returns) (High Power Rocket) Rules 2019, r 7.

33 A 'responsible party', for the launch or return of a space object means, broadly, the holder of the permit, licence or authorisation. In any other case, it refers to: (1) the persons who carried out the launch or return of the space object; (2) any person who, at any time during the liability period for the launch or return, owned all or some of any payload forming part of the space object concerned; or (3) any other person specified in the rules. In these circumstances, if the space object was launched from a facility (whether fixed or mobile), or place, outside Australia, or if the space object was returned to a place or area outside Australia, a person is only a responsible party if the person is also an Australian national (Space (Launches and Returns) Act 2018 (Cth), s 8).

situation, the applicant would be required to obtain both an overseas payload permit, to authorise the launch of the payload from a place outside Australia, and an Australian launch permit, to authorise the launch of the payload from the Australian aircraft. Whether this was intended by the legislature is unclear.

Return authorisations

The requirement for a return authorisation is a new feature in the Launches and Returns Act and reflects the much greater number of launches expected in the future.

A return authorisation is required if a person intends to return a space object to a specified place or area in or outside Australia.³⁴ A return authorisation can also authorise a particular series of returns if the Minister considers it appropriate.

Similar considerations that regulate the exercise of the Minister's discretion in relation to the other licences and permits under the Launches and Returns Act also apply to the grant of return authorisations. The Rules also set out the specific information that an applicant needs to provide to satisfy the Minister in relation to this criteria, and are broadly consistent with the information requirements that apply to the other licences and permits.

Authorisation certificate

An authorisation certificate may also be issued by the Minister to any person that intends to conduct launch-related activities that would otherwise be prohibited.

The factors to be considered when assessing applications include: (1) the competency of the person to carry out the proposed conduct; (2) the probability of the Australian government being exposed to liability for damage caused by the conduct; and (3) the probability of the conduct causing substantial harm to public health or safety, or damage to property.

Authorisation certificates will only be granted in circumstances where the conduct could not be more appropriately covered by another type of licence or permit under the Launches and Returns Act. This is likely to be in very limited or unusual circumstances.

Other licence requirements

The following types of licences may also be required, depending on the nature of the activities being conducted and services being supplied by the licensee or permit holder in Australia.

Telecommunications licensing requirements

Under the Telecommunications Act 1997 (Cth), a carrier licence is required where a person owns items of physical network infrastructure known as network units (i.e., physical cable, radio or satellite links) that are used to supply a carriage service³⁵ to the public. If a person intends to use space or satellite infrastructure to provide telecommunications services to customers in Australia, a carrier licence may be required.

Radcommunications licensing requirements

An apparatus licence is required to authorise the use of frequencies for individual space objects or Earth stations, unless the component is covered by an existing class licence. The approach

³⁴ Space (Launches and Returns) Act 2018 (Cth), s 46L.

³⁵ A 'carriage service' means a service for carrying communications by means of guided and/or unguided electromagnetic energy (Telecommunications Act 1997 (Cth), s 7).

that the Australian Communications and Media Authority (ACMA) takes is to separately licence the satellite uplink and downlink components (which require a carrier licence) and the transmitters and receivers on satellites (which require apparatus licences).

A spectrum licence is required to authorise the use of particular frequencies by those with carrier licences. Although spectrum licences are, in theory, available as an alternative to apparatus licences, they are generally reserved by the ACMA for use by terrestrial mobile service providers. This is likely to continue with the increase in the demand for spectrum by these providers to support the deployment of 5G services.

Australia's radiocommunications legislative and policy framework, including the existing licensing regime and approach to the management of spectrum, has been the subject of review by the government since 2014 and is slated for comprehensive reform. The Minister for Communications, Cyber Security and the Arts, Paul Fletcher MP, who was appointed in 2019, has most recently indicated that this reform will take place via amendments to the existing legislation, rather than a complete overhaul of it. This could result in changes (and hopefully simplifications) to the licensing arrangements described above, but fall short of the much-needed reform of the regime more generally.

ii National registration requirements

There is no obligation for licensees or permit holders to register with the ASA in relation to the conduct of their space activities.

However, as required by the Registration Convention, a register of space objects is kept and maintained by the Minister, which contains details of the space objects that are launched into Earth's orbit or beyond under an Australian launch permit, overseas payload permit or authorisation certificate. These details, which are provided by the applicant during the application process (and post launch), include the launch facility, the date of the launch, the space object's basic orbital parameters and general functions, and the names of launching states other than Australia.

iii Insurance requirements

One of the key features of the Launches and Returns Act is a reduction in the specified minimum liability caps for third-party insurance requirements for each authorised launch or return – from A\$750 million to a maximum of A\$100 million. This amendment is designed to comply with the government's liability obligations under the Liability Convention and to promote consistency with the approach to insurance and liability adopted in other jurisdictions.

The Rules,³⁶ which contain the specific details of these insurance requirements, provide that the amount of insurance required is the lower of the specified amount of A\$100 million (except for an overseas payload permit or return authorisation, which specifies an amount of A\$0) or the amount that is calculated according to the maximum probable loss (MPL) methodology. The MPL methodology is published in a document that is available on the Department of Industry, Innovation and Science's website.³⁷

36 Space (Launches and Returns) (Insurance) Rules 2019.

37 <https://www.industry.gov.au/sites/default/files/2019-08/maximum-probable-loss-methodology-for-space-activities.pdf>.

Alternatively, an applicant can satisfy the insurance and financial requirements under the Launches and Returns Act by showing that it has direct financial responsibility for an amount that is not less than those specified amounts. This requires it to demonstrate that it has sufficient available assets or is otherwise able to meet any liability that it may incur in the course of conducting its space activities.

iv Space Debris Mitigation Guidelines

Each application for a launch permit or an overseas payload permit must contain a debris mitigation strategy. This is a new feature of the Launches and Returns Act that reflects Australia's commitment to contribute to international efforts to limit space debris.

The debris mitigation strategies are to be based on internationally recognised guidelines or standards (e.g., the UN Space Debris Mitigation Guidelines) and must describe, for example, the planned measures to minimise the potential for break-ups during operational phases and during the post-mission phase, and the strategies to limit the risk of accidental collisions in orbit.

v National security requirements

Australia's national security is one of the key themes underpinning the operation of the Launches and Returns Act. It is one of the factors that must be taken into account each time the Minister considers a licence, permit or authorisation application (i.e., reasons relevant to Australia's security, defence or international relations).

National security is also one of the grounds upon which the Minister can decide to suspend a licence, permit or authorisation – the other two being breach of a licence or permit condition, or the occurrence of an incident involving the relevant space object. This could have significant ramifications for licence or permit holders in circumstances where an incident occurred in the applicant's home country, or tensions grew between the government of the applicant's home country and the Australian government. In these circumstances, the Minister could suspend the licence, permit or authorisation on national security grounds, and no compensation (including the cost of the investment) would be payable.³⁸ It would also be difficult for applicants to challenge these decisions as the Launches and Returns Act explicitly provides that this discretion rests with the Minister.

vi Safety requirements

A key safety mechanism under the Launches and Returns Act is the Launch Safety Officer (LSO). The LSO is responsible for ensuring that certain processes and procedures are correctly followed in relation to the conduct of space activities to mitigate the risks of injury to persons and damage to property.

The Launches and Returns Act extends the functions and powers of the LSO to cover not only launch activities, but also return activities. It requires the LSO to issue certain notices in respect of launch and return activities, and empowers the LSO to issue written directions to licence and permit holders where appropriate to do so. Penalties apply for a failure to comply with a direction issued by the LSO.

³⁸ Space (Launches and Returns) Act 2018 (Cth), ss 27; 37; 46A; 46K; 46T; 46Y.

vii Monitoring and enforcement requirements

One of the key functions of the LSO is to monitor the compliance of the holder of the licence, permit or authorisation with the terms of the Launches and Returns Act and the conditions of the permit or authorisation. The ASA also has a dedicated team that is responsible for administering the Launches and Returns Act, including the undertaking of compliance and enforcement activities. This division of the ASA – the Regulatory and International Obligations Team – subsumes the role of the former Space Licensing and Safety Office.

Penalties for non-compliance have increased significantly under the Launches and Returns Act (see subsection i, ‘Launch permit’ and ‘High-power rocket permit’).

viii Dispute resolution mechanisms

Review of decisions

If a person wishes to have a decision of the Minister reviewed, an application can be made to the Administrative Appeals Tribunal (AAT). The AAT reviews administrative decisions made under Commonwealth laws on the merits.

The AAT has the power to affirm, vary or set aside and substitute the previous decision in favour of a new decision. It can also remit a decision to the relevant decision maker for reconsideration.

Action for compensation

Any actions for compensation for damage caused by the launch and return of a space object and the launch of high-power rockets are to be heard by the Federal Court and Federal Circuit Court. Any appeal to a decision of these courts would need to be brought before a court of appellate jurisdiction.

III DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

Following the commencement of Australia’s new legislative framework, the country now has some of the most business-friendly space laws in the world, including among the key spacefaring nations (e.g., France, the United Kingdom and the United States). It also has the most recently established national space agency – the ASA – responsible for administering the new legislation and delivering on Australia’s space-related international obligations under it.

Some of the key features that underpin the more commercial and forward-looking approach of the new regime under the Launches and Returns Act include:

- a* the arrangements for the launches from aircraft in flight, as well as the launching of high-power rockets;
- b* the streamlined approvals process for obtaining the various licences, permits and authorisations required under the Launches and Returns Act;
- c* the significant reductions in the insurance requirements for each authorised launch or return (from A\$750 million to a maximum of A\$100 million); and
- d* the requirements for a space debris mitigation strategy.

As well as having a new legislative framework, Australia also has a robust policy framework. This comprises the Australian Civil Space Strategy 2019–2028 (discussed in Section IV.ii) and the annual State of Space Report (SOSR). The SOSR documents the government’s activities in civil space for the prior calendar year and groups these activities under four

main themes: policy and regulation; space capability; national interest; and international engagement. It is an important policy document that is designed to provide both industry and government stakeholders with an overview of past and current space-related initiatives, as well as to identify emerging commercial opportunities.

While the ASA will be responsible for overseeing this policy and the strategic direction of Australia's civil space sector, it will adopt a consultative approach in carrying out this objective. The ASA will be informed by the government's Space Coordination Committee, and consult with industry through the Space Industry Leaders Forum, which will include industry representatives, academia, industry associations and other non-government space organisations. This level of engagement with both industry and government stakeholders – another key feature of the national framework – is designed to inform the regulator on key issues and promote interest from both local and overseas industry participants in conducting commercial launch activities from Australia.

IV CURRENT DEVELOPMENTS

The past couple of years have seen Australia reassert itself on the global space stage, and transition from an introspective³⁹ member of the space community to a forward-thinking, action-oriented one. In the past 12 months alone, Australia has introduced a new body of targeted laws and regulations, established a national space agency (the ASA) and formalised a number of cooperative arrangements with various international partners. These are manifestations of a maturing and focused national space policy and demonstrate a clear recognition of the importance of space to Australia's future.

i Launches and Returns Act

As discussed in Section I.ii, the Launches and Returns Act passed both houses of Parliament and came into effect on 31 August 2019. It will result in a number of changes to the existing legislative regime, which are designed to promote participation, investment and innovation in Australia's space industry.

The Rules will support the Act by providing much of the operational detail, including the information that an applicant will need to provide for different licences and permits, as well as the relevant insurance requirements and conditions for certain permits and licences.

The new legislative regime will have important implications for established space industry players and the emerging small satellite and launch industry players, both in Australia and overseas. The reductions in cost and administrative barriers to participation are likely to pave the way for a more open market and create new commercial opportunities for companies looking to continue, or expand, their investments in space-related activities in Australia.

ii ASA

As mentioned in Section I.iii, the ASA was formally established on 1 July 2018 and tasked with the ambitious goal of tripling the value of Australia's space industry to A\$10–12 billion by 2030.

³⁹ Freeland, above n 4, 525.

Since then, the ASA has become an industry-focused regulator, leading Australia's engagement with international space agencies and industry participants, formulating new space strategy and policy to better coordinate Australia's domestic space sector activities and developing new programmes – the International Space Investment Initiative and the Space Infrastructure Fund (see below) – to help grow Australia's space industry.

Engagement with industry and international partners

The ASA has now entered into formal partnerships with a number of counterpart agencies in Canada (the Canadian Space Agency), France (the National Centre for Space Studies), the United Kingdom (the UK Space Agency) and the United Arab Emirates (the UAE Space Agency). The memorandums of understanding that exist between the ASA and these international partners are designed to promote increased collaboration and cooperation between the agencies and help them develop their respective space programmes and capabilities.

The ASA has also been leading Australia's engagement with other industry players, including Airbus Defence and Space SAS, Boeing, Goonhilly, Sital Australia, Lockheed Martin, Nova Systems and, most recently, Myriota. Under the statements of strategic intent with these companies, the parties agree to provide support and collaboration on opportunities for investment and areas of strategic interest and growth. Interestingly, the companies range from start-ups to some of the biggest global space companies.

Advancing space: Australian Civil Space Strategy 2019–2028

In April 2019, the ASA released a 10-year plan to guide the growth and development of Australia's domestic space industry: the Australian Civil Space Strategy 2019–2028 (the Strategy).

The Strategy establishes the following four 'space pillars' to promote the competitiveness of Australia's domestic space industry:

- a* International: opening the door for Australian players to leverage off international partnerships.
- b* National: developing national capability in areas of competitive advantage.
- c* Responsible: guiding the safety of activities to protect Australia's national interest.
- d* Inspire: building the next generation of workers for the industry.

It makes clear that 'meeting Australia's international obligations, and supporting rules-based order, are central to achieving that vision'.⁴⁰

The above-mentioned pillars are to be delivered in three phases: setting the conditions for growth (2018–2019); engaging with opportunity (2019–2021); and delivering success (2021–2028). The activities to be carried out under each of the pillars during these phases are to be guided by the seven National Civil Space Priorities:

- a* position, navigation and timing;
- b* Earth observation;
- c* communications technologies and services;
- d* space situational awareness and debris monitoring;

⁴⁰ Australian Space Agency (2019), *Advancing Space: Australian Civil Space Strategy 2019–2028*, Canberra: Commonwealth of Australia, April: available at <https://www.space.gov.au>.

- e* leapfrog research and development;
- f* robotics and automation on Earth and in space; and
- g* access to space.

As part of the Strategy, the ASA has committed to report every two years on its progress towards achieving its mandate to triple the value of Australia's space industry. The first report is due in 2021.

New space programmes

International Space Investment Initiative

In the 2018–2019 budget, the government announced the International Space Investment (ISI) initiative, under which it committed to provide A\$15 million over three years from 2019 to 2022 to provide grants to strategic space projects that provide employment and business opportunities for Australians.

Following a period of industry consultation, the ISI initiative was launched by the ASA in October 2019. Application for grants (which are to be between A\$100,000 and A\$4 million) close in December 2019.

Space Infrastructure Fund

In the 2019–2020 budget, the government committed to providing A\$19.5 million for a new Space Infrastructure Fund, which includes A\$6million for a new mission control centre to be established in South Australia to assist with the management of small satellite missions and the development of satellite technology.

The Space Infrastructure Fund will be administered by the ASA and used to support space projects being carried out across the states and territories over the next three years that promote Australia's competitiveness in the global space industry.

V OUTLOOK AND CONCLUSIONS

In 2019, almost 50 years on from the launch of WRESAT 1, Australia is set to reclaim its place as a leading spacefaring nation. With the establishment of the ASA, the introduction of a new targeted space activities framework and improvements to the funding of its space budget, the regulatory and policy settings are finally in place to support the growth of Australia's space sector.

These changes are likely to be of particular importance to the emerging small satellite (CubeSat) and launch industry players looking to take advantage of the reductions in cost and administrative barriers to participation in space. They will also be of interest to existing players in the space industry, particularly those based overseas, that are looking to explore new commercial opportunities presented by the rapid growth in demand for space-based services. This includes those that are required to support the emerging internet of things and 5G ecosystems, such as Earth observation, space situational awareness, mobile backhaul and global connectivity solutions. It also includes future space opportunities that are likely to emerge with the continued growth in the exploration and use of outer space, such as space mining and human space flight.

To support these future space activities, the Strategy (see Section IV.ii) indicates that it is intending to implement a risk management framework before the end of 2020, and to consider and develop the necessary regulatory arrangements between 2021 and 2028.

During this period, the ASA will continue to engage with industry and international partners (including counterpart agencies) to guide its approach to the development of Australia's space regulatory framework.

In 2017, it was estimated that the Australian space sector was producing revenues of around A\$3 billion to A\$4 billion and had an estimated workforce of between 9,500 and 11,500 people.⁴¹ These figures represent a very small fraction of the total value of the space industry, which is estimated to be worth around US\$350 billion, a figure that is expected to grow to over US\$1.1 trillion by 2040.⁴² If Australia is to reach its goal of growing its space industry to A\$10–12 billion and creating up to 20,000 jobs by 2030, the government will need to work closely with industry to ensure that it is maintaining the ideal regulatory and commercial conditions for Australian and foreign businesses to participate and compete in the emerging space industry.

41 Dougherty, above n 2, 177.

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

GERMANY

*Grace Nacimiento*¹

I INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

Germany is party to almost all the UN space treaties. The implementation of public international law treaties into German law requires a formal Consenting Act to be adopted by the German legislative body when the subject of the respective treaties are matters within the competence of the federal state.² This is the case with the international space treaties.

The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies of 1967 entered into force in Germany in 1971. In the same year, the Consenting Act implementing the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space of 1968 was adopted. The Convention on International Liability for Damage Caused by Space Objects of 1972 was implemented in 1975. Finally, the Convention on Registration of Objects Launched into Outer Space of 1975 entered into force in 1979 following the respective Consenting Act.

In 1998, Germany signed the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations, but has yet to ratify it.

Germany is not a party to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies of 1979.

The body acting in the function of a space agency is the German Aerospace Centre (DLR). The German government transferred all administrative functions related to the space sector to the DLR by law in 1998.³ The DLR is responsible for planning German space activities, implementing German space programmes and representing Germany's space-related interests at international level.

The DLR signed the International Charter on Space and Major Disasters in 2010 and has since then contributed to providing satellite imagery for disaster monitoring purposes. It also represents Germany in the Inter-Agency Space Debris Coordination Committee (IADC), which was formally established in 1993 upon an initiative of the European Space Agency (ESA). As a member of the IADC, the DLR participates in drafting guidelines on space debris-related issues.

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2 Art. 59 para. 2 sentence 1 of the German Constitution.

3 Law governing the transfer of administrative functions in the sector of outer space activities, 22 August 1998.

In 2007, Germany adopted the Satellite Data Security Act (the Data Security Act).⁴ This Act regulates the operation of high-quality Earth remote sensing systems and the provision of data generated by these systems with a view to protecting national security interests. It contains a number of authorisation, licensing and permit requirements for system operators and data providers (see Section III).

The publication of the National Space Programme in 2001 by the Federal Ministry for Economic Affairs and Energy (the Ministry) was a milestone in German space policy. The Programme aims to define a comprehensive approach to space policy, including Germany's participation in the European Space Agency and the European Organisation for the Exploitation of Meteorological Satellites, and project funding at national level, including for systematic research and development programmes.

Subsequently, in 2010, the government published its national Space Strategy,⁵ which defines the principal goals to be pursued in the space sector. Among these, the government announced the adoption of a Space Act to create a comprehensive legal framework for government and private commercial space activities. The declared aim was to significantly increase the German share in the worldwide commercial turnover of space activities. The Space Act is yet to be published. The Ministry recently reaffirmed the intention of enacting national space legislation and announced that a first draft will be published in 2020. Consequently, at the time of writing, there are no specific laws and regulations in Germany with respect to, among other things, satellite launches, procurement of satellite launches or launch services agreements. Space-related law and regulation is rather exclusively focused on transferring orbit usage rights and granting the necessary frequency assignments for the operation of satellites and ground stations. The only specific space-related legislation regulates the operation of high-grade Earth observation systems that are subject to approval requirements and strict security regulations.

II REGULATION IN PRACTICE

As mentioned in Section I, Germany has not yet adopted any specific legislation or regulation governing commercial space activities. Therefore, many aspects that are relevant for space business activities, which would provide a comprehensive body of laws and regulations in this sector, are yet to be regulated. This includes issues related to launching activities, as well as insurance and liability.

Regulation in practice is thus focused on coordination and spectrum issues, which traditionally have been (and continue to be) part of the national telecommunications legislation, namely the German Telecommunications Act, as last amended in 2019 (the Telecoms Act). The Telecoms Act does not establish a 'licensing' regime in the strict sense, but rather regulates the proceedings for a satellite operator to obtain the rights required to use the necessary orbital slots and spectrum.

The use of orbital slots and spectrum usage rights for the operation of satellite systems require the previous transfer and assignment of the respective rights by means of a satellite filing and a national spectrum assignment proceeding. The national authority in charge

4 Act to give Protection against the Security Risk to the Federal Republic of Germany by the Dissemination of High-Quality Earth Remote Sensing Data, 28 November 2007.

5 See the original in German at <https://www.dlr.de/dlr/Portaldata/1/Resources/documents/2019/zukunftsfaehige-deutsche-raumfahrt.pdf>.

of making the filings to the International Telecommunication Union (ITU) is the Federal Network Agency for Electricity, Gas, Telecommunications, Post and Railways (BNetzA), headquartered in Bonn.

i Licensing requirements

According to the Telecoms Act, any entity wishing to use orbit slots and spectrum via satellites is subject to the obligations resulting from the ITU Constitution and Convention.⁶ The operation of a satellite system requires the transfer and assignment of orbit and frequency usage rights from the German government to the operator. Both proceedings, the transfer of orbit rights and assignment of frequency usage rights, are conducted by BNetzA. Any satellite system or network must first be registered, coordinated and notified to the Radiocommunication Bureau of the ITU through BNetzA. Furthermore, if necessary, the operator must apply for the assignment of frequencies required to operate ground stations, namely the spectrum required for Earth–space and space–Earth connections.

ii Licensing procedures

As mentioned above, the procedure to apply for the necessary transfer of orbit and frequency usage rights⁷ is regulated in the Telecoms Act. The requirements to be fulfilled by the applicants are based on the relevant ITU Radio Regulations. In addition, in December 2018 BNetzA published administrative rules setting out the ‘Procedures for the advanced publication, coordination and notification of satellite systems in the name of Germany and for the assignment of orbit and frequency usage rights’ (the Administrative Rules). The Administrative Rules describe in detail the national procedure to be followed and the conditions to be fulfilled by the operator to obtain the necessary orbit and frequency usage rights.

The operator must submit an application to BNetzA requesting the authority to initiate the filing of its satellite system at the ITU Radiocommunication Bureau and start the international advance publication (if required), coordination and notification proceedings. When submitting the application to BNetzA, the operator must prove that it has financial means available to pay the administrative costs incurred in the ITU proceedings and charged by the ITU-based Council Decision 482.⁸ The operator must also show evidence of the availability of qualified staff to assist BNetzA throughout the proceedings, including, if required, travelling abroad to support BNetzA in international negotiations and coordination meetings.

iii Conditions to obtain a licence

In principle, orbit and frequency usage rights will be transferred to the operator if the following conditions, set out in the Telecoms Act,⁹ are met:

- a* the requested orbit and frequency usage rights must be available (i.e., allocated to the relevant satellite systems and not already assigned to another operator);

6 Section 56 para. 1 Telecoms Act.

7 Sections 56 and 55 para. 1 Telecoms Act.

8 Council Decision 482, Implementation of cost recovery for satellite network filings.

9 Section 56 para. 2 Telecoms Act.

- b* the planned satellite system must be compatible with other spectrum uses and registrations of other satellite systems (i.e., it must not cause harmful interferences to other spectrum uses and satellite systems); and
- c* public interests must not be infringed.

These general conditions are further specified in BNetzA's regulatory practice, in particular based on the Administrative Rules, as follows. Prior to the submission of an application to BNetzA to commence the satellite network filing at the ITU, the operator must verify that the frequencies it intends to use are allocated to satellite-based radio services in the national Frequency Allocation Ordinance¹⁰ and the Frequency Usage Plan.¹¹ The Frequency Allocation Ordinance is issued by the Ministry and is based on the ITU Radio Regulations as implemented in German law.¹² The Frequency Usage Plan is published by BNetzA. It contains further details and specifications set by BNetzA at national level as to the specific services allowed in the different bands and the technical usage conditions to be complied with. Compliance with the Frequency Allocation Ordinance and the Frequency Usage Plan will be reviewed by BNetzA prior to submitting an application for a satellite network filing to the ITU and is a precondition for initiating the international procedures.

As to the application form, the operator is required to use the relevant ITU forms. In accordance with the requirements for the transfer of orbit and frequency usage rights under the Telecoms Act¹³ as further detailed in the Administrative Rules, BNetzA stipulates that the following must be included in the application:

- a* the applicant's details (name, address and legal form, including shareholdings in the company);
- b* completed ITU forms in paper form and in electronic format, and all necessary supporting data (if the ITU requires a coordination request, applicants must submit the required advance publication information and coordination request);
- c* a statement with respect to the public interest in the filing, including a statement on whether the project is being supported by public funds or a public guarantee, or that this support has been applied for, stating the level of support and the source;
- d* details regarding the implementation of the coordination procedure, including a description of the envisaged proceeding and, as mentioned above, evidence of the availability of qualified staff and financial resources, evidence of the availability of the required ITU resources, in particular the ITU's BR International Frequency Information Circular (BR IFIC) – Space Services, and designation of a contact person and representative for international coordination procedures;
- e* a binding statement that the applicant will comply with the ITU's provisions;
- f* evidence of a trust account or bank guarantee to cover the ITU's cost-recovery charges, and a binding declaration that the applicant will cover BNetzA's costs in the filing procedures; and

10 Frequency Allocation Ordinance of 27 August 2013, as amended in 2018.

11 BNetzA Frequency Plan, as at March 2019.

12 Germany is party to the Constitution and Convention of the ITU. The Frequency Allocation Plan implements Art. 5 of the ITU Radio Regulation (RR). Art. 5 Section IV RR contains the Table of Frequency Allocation, which is implemented through the Frequency Allocation Ordinance.

13 Section 56 para. 2 Telecoms Act.

g a detailed business and frequency usage plan, including, in particular, a detailed description of the satellite network, the type of services to be offered, evidence supporting the need for the requested frequency and orbital resources, and a detailed explanation of how efficient and interference-free use will be ensured by the applicant.

iv Insurance coverage requirements

The statutory and regulatory provisions do not include any requirements on insurance coverage and third-party liability.

v Compliance with space debris mitigation guidelines

Regarding compliance with obligations under international law on space activities, there is no reference in the law or in the Administrative Rules to specific obligations. Neither is there a reference to legally non-binding instruments, such as the space debris mitigation guidelines in relation to end-of-life disposal. It remains to be seen whether the Space Act will include provisions regarding the obligations of satellite system operators in this respect.

vi National security and safety requirements, and lawful interception

Service providers and telecommunications network operators are subject to technical protection requirements established in the Telecoms Act.¹⁴ To the extent that a satellite network is operated in or from the German territory or publicly available satellite-based telecommunications services are offered in Germany, these requirements apply. The relevant provisions oblige service providers and network operators to take appropriate organisational and technical measures for the protection of privacy of telecommunications and against violation of personal data protection. BNetzA publishes a detailed catalogue specifying the technical requirements regarding data and system security. Furthermore, notification requirements apply in the event of violations of personal data protection.¹⁵

In addition, as mentioned in Section I, operators of high-quality Earth remote sensing satellite systems are subject to the Data Security Act. This Act establishes special security requirements regarding the handling of data generated by these systems until the data is disseminated and provided to the persons requesting access to them (see Section III).

The Telecoms Act also establishes obligations with respect to lawful telecommunications interception requirements.¹⁶ These requirements apply to operators of telecommunications installations for the offer of publicly available telecommunications services. The respective requirements are further specified by an Ordinance issued by the Ministry.¹⁷ Technical details are set out in the Technical Guidelines for the implementation of interception measures as published by BNetzA. The Technical Guidelines, however, cover the implementation of interception measures with respect to terrestrial mobile and fixed networks only. While the operation of satellite networks from German territory falls into the scope of application of the requirements under the Telecoms Act, the Technical Guidelines do not provide any specifications as to the implementation.

14 Sections 109 Telecoms Act.

15 Section 109a Telecoms Act.

16 Section 110 Telecoms Act.

17 Telecommunications Interception Ordinance of 3 November 2011, as amended in 2017.

vii Administrative proceedings

BNetzA reviews an operator's application in detail, and, in general, only submits the satellite system filing to the ITU if and when the application is deemed to be complete.

Following submission of the application and advanced publication (where required) in the ITU's International Frequency Information Circular, BNetzA requires applicants to actively participate in the international coordination procedure. While BNetzA assists the applicant during this phase, the responsibility for achieving the necessary coordination lies with the applicant.

The transfer of orbit and frequency usage rights requires previous coordination at national level, conducted by BNetzA. If objections are raised by other German satellite systems operators and spectrum users, BNetzA will decide if it is necessary to modify the filing at the ITU. Again, BNetzA expects the applicant to actively participate in the national coordination procedure, including performance of technical studies regarding compatibility issues.

After successful completion of the filing procedure at the ITU and the coordination proceeding at national level, BNetzA transfers the requested orbit and frequency usage rights to the operator by issuing a respective formal assignment. This procedure includes the national procedure for the assignment of individual frequency usage rights as provided for in the Telecoms Act.¹⁸ The requirements set forth in the Telecoms Act in this respect are largely identical to the requirements and conditions fulfilled by the operator during the satellite system filing at the ITU.

BNetzA charges a one-time fee for conducting the satellite system filing procedure at the ITU. The fee is calculated in accordance with the Frequency Fee Ordinance¹⁹ and covers administrative costs. In addition, the operator must pay any other costs related to the filing procedure as well as the costs under Council Decision 482, which are payable directly to the ITU. Furthermore, under the Telecoms Act, the operator is also subject to a yearly fee according to the Frequency Protection Fee Ordinance.²⁰

viii Monitoring and enforcement requirements

After transferring the orbit and frequency usage rights to the operator, BNetzA monitors the actual use of the rights. Specifically, BNetzA is entitled to revoke the assigned rights if they have not been used for more than a year or if the conditions for the assignment of the rights are no longer being fulfilled.²¹

In addition, the general provisions of the Telecoms Act related to the revocation of frequency assignments apply.²² The revocation is subject to BNetzA's discretion under certain conditions set out by law. In general, BNetzA is entitled to revoke frequency assignments if frequencies remain unused, are not used for the purpose for which they have been assigned or the frequency holder repeatedly violates the assignment conditions.

Non-compliance with the relevant provisions of the Telecoms Act constitutes an administrative offence sanctioned with fines.

18 Section 55 para. 1 Telecoms Act.

19 Frequency Fee Ordinance of 21 May 1995, as amended in 2016.

20 Frequency Protection Fee Ordinance of 15 June 2015.

21 Section 56 para. 4 Telecoms Act.

22 Section 63 Telecoms Act.

ix Dispute resolution mechanisms available for appeals against licence decisions

BNetzA issues formal decisions regarding the transfer of orbit and frequency usage rights as well as the frequency assignment under national law in the form of administrative acts. The same applies to any other BNetzA decision related to the rejection of applications, the revocation of assigned frequency rights and the fees charged. Administrative acts can be challenged by filing an objection with BNetzA first. If BNetzA confirms the contested decision by issuing a respective decision, this decision may then be challenged before the administrative courts.

III DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

Germany provides for a special legal framework for the operation of high-quality Earth remote sensing systems and the dissemination of data generated by these systems. This highly regulated space activity serves national security objectives. To this end, Germany enacted the Data Security Act in 2007. The Act:

- a* applies to the operation of high-quality Earth remote sensing systems by German nationals or by legal persons or associations of persons under German law;
- b* applies to foreign legal persons or foreign associations of persons if their head office is located in Germany;
- c* applies to the extent that non-changeable command sequences for controlling the orbital system are executed from German territory;
- d* applies only to private, commercial (i.e., non-governmental) operations of Earth remote sensing systems;
- e* regulates the handling of data generated by high-quality Earth remote sensing systems up to their dissemination, the latter being defined as circulating or making available the data to third parties; and
- f* provides for restrictions with respect to the acquisition of operators by foreign entities or German entities with foreign shareholders.

In addition to the above, there are various authorisation and licensing requirements. The authority responsible for supervision and implementation of the Act is the Federal Office for Economic Affairs and Export Control (BAFA).

A high-quality Earth remote sensing system falling into the scope of application of the Data Security Act is defined as a space-based transport or orbital system, including the ground component, generating Earth data, to the extent that its sensors are technically capable of generating data with a particularly high content of information. In 2008, the Ministry published the Ordinance on the Data Security Act. This Ordinance defines, among other things, the data to be considered as having a particularly high content of information. In general, this is the case if sensors are capable of generating a geometrical resolution of 2.5 metres or less in at least one spatial direction. The Ordinance also defines additional and more specific criteria in this respect.²³

23 cf. Section 1 para. 2, No. 1-3 Ordinance on the Data Security Act of 2008, as amended in 2014.

The operation of an Earth remote sensing system is subject to an authorisation issued by BAFA.²⁴ The prerequisites for obtaining an authorisation are set out in detail in the Data Security Act.²⁵ The authorisation will be granted if, among other things, the operator:

- a* provides proof of its reliability;
- b* executes the command sequences related to the control of the various elements of the system in Germany and protects against any modifications by third parties;
- c* protects the data transmission against unauthorised access; and
- d* establishes appropriate technical and organisational measures preventing unauthorised access by third parties to the technical equipment controlling command functions of the system and the equipment for receiving, processing and storing data, as well as access to the respective premises.

Procedures used to ensure protection of system control functions and data transmission must be approved by the Federal Office for Information Security (BSI). Further obligations to be complied with by operators relate to documentation and information requirements.

The Data Security Act distinguishes between the system operator – the entity controlling the operation of the Earth remote sensing system – and the data provider. The latter is defined as any person disseminating data generated by a high-quality Earth remote sensing system²⁶ (i.e., making the data available to third parties). A data provider is subject to a licensing requirement.²⁷ To obtain a licence, the data provider must prove its reliability and submit evidence showing that appropriate technical and organisational measures have been taken to protect data transmission, processing and storage as well as access to the respective equipment and premises. Again, procedures used to comply with these requirements must be approved by the BSI. The data provider is also subject to various notification and information requirements. Officials of BAFA are entitled to enter the premises of the data provider and take measures to ensure compliance.

The dissemination of data generated by high-quality Earth remote sensing systems is subject to a procedure requiring the data provider to verify any request for data dissemination to determine the sensitivity of the request.²⁸ In principle, a request qualifies as being sensitive if the following aspects, considered together, have the potential to harm Germany's vital security interests: the data information content achieved through the operation of the sensor and the processing form used; the target area displayed with the data; the point in time and the time period between the generation of the data and responding to the request; and the location of the target ground segments. Further details regarding this verification process are set out in the Ordinance on the Data Security Act. Any request from the German government or the German military or intelligence authorities is not considered sensitive, meaning that it will be processed without any further verification. Such a request must also be given priority under certain circumstances established in the Data Security Act.²⁹ The Ordinance specifies the conditions for detecting potential harm to Germany's security

24 cf. Sections 3 et seq. Data Security Act.

25 cf. Section 4 Data Security Act.

26 Section 2 para. 1 No. 2 Data Security Act.

27 cf. Section 11 et seq. Data Security Act.

28 Section 17 Data Security Act.

29 Section 21 Data Security Act.

interests, thereby identifying sensitive requests. Furthermore, the Ordinance includes various annexes containing positive and negative lists of states and recipients to be considered when verifying the sensitivity of a request.³⁰

Responding to a sensitive request for transmission of data generated by high-quality Earth remote sensing systems requires a formal permit. This permit is also required if the data is to be disseminated without a request.³¹ Upon the application of a data provider, BAFA will grant the permit if dissemination of the data does not jeopardise Germany's vital security interests, disturb the peaceful coexistence of states or interfere with Germany's external relations. Under certain circumstances specified in the Data Security Act, a data provider may apply for a collective permit to avoid case-by-case applications to respond to sensitive requests for data transfer.

IV CURRENT DEVELOPMENTS

i Pending cases

In Germany, as in a number of other EU Member States, the spectrum assignments under the EU Decision on mobile satellite services (MSS) (the MSS Decision)³² are currently under dispute. The European Commission awarded spectrum based on this decision to facilitate the development of a competitive internal market for MSS across the European Union and to ensure gradual coverage in all Member States.³³ Inmarsat Ventures Limited (Inmarsat) and Solaris Mobile Limited (now EchoStar Mobile Limited) were the operators awarded spectrum.³⁴

In 2017, BNetzA initiated a public hearing regarding Inmarsat's plans to use the spectrum awarded under the MSS Decision for the operation of a European Aviation Network (EAN).³⁵ BNetzA concluded that the spectrum use for the EAN was permitted under certain conditions to be met by Inmarsat and, in 2018, issued a 'specifying frequency assignment' allowing the use of this spectrum for the EAN operated by Inmarsat and partners to offer high-speed internet access in aircrafts. However, BNetzA's decision is being challenged and is subject to administrative and court proceedings initiated by competitors. The underlying issues relate to the requirements to be fulfilled by Inmarsat regarding the satellite system, including that ground components are to be complementary to the satellite components and the coverage obligations according to the common conditions in the MSS Decision. Furthermore, competition aspects are at the core of the disputes. Competitors claim that change of spectrum usage from providing MSS, in particular to provide broadband coverage

30 cf. Annex 1: negative list of states with respect to the location of ground components; Annex 2: positive list of target states for data transmission; Annex 3: negative list states for data transmission with respect to the location of the requesting person; Annex 4: positive list of potential recipients of data. cf. Annex 5 for a detailed chart showing the steps of the sensitivity verification.

31 Section 19 Data Security Act.

32 Decision No. 626/2008/EC of the European Parliament and the Council of 30 June 2008 on the selection and authorisation of systems providing mobile satellite services (MSS), OJ 2008 L 172/15.

33 Art. 1 Decision No 626/2008/EC.

34 Commission Decision 2009/449/EC of 13 May 2009 on the selection of operators of pan-European systems providing mobile satellite services (MSS), OJ 2009 L 149/65.

35 https://www.bundesnetzagentur.de/SharedDocs/Downloads/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Frequenzen/SpezielleAnwendungen/Satellitenfunk/20160530_AnhoerungInmarsatMSS_PDF.pdf?__blob=publicationFile&cv=1.

in underserved areas to offering high-speed internet access to passengers in aircrafts, is not covered by the MSS Decision and thus should have been subject to a new award proceeding open to all interested companies.

Administrative and court proceedings are still pending at the time of writing.

ii Legislative initiatives

As mentioned in Section I, the Ministry announced that a first draft of the Space Act will be published in 2020. While it is known that the Space Act will aim to encourage private commercial space activities, there is little public information available on its specific contents. The coalition agreement of the current government merely states that a Space Act will be initiated to ensure investment and legal certainty for non-governmental space activities. According to Ministry officials, the goal is to create a legal framework for commercial space activities encouraging private investment with low bureaucratic hurdles and as little regulation as possible. In particular, national provisions limiting liability of and enabling affordable insurance coverage for private entities in the space market are considered to be essential if commercial activities are to be promoted in the German market. Apparently, the Space Act will not establish national provisions for space mining activities. The Ministry announced in this respect that it would rather support activities at international level aiming at consistent international rules regarding space mining.

Furthermore, the government included in the coalition agreement their intention to participate in the establishment of a global space weather centre to research and mitigate space weather risks for national technical infrastructure.

It remains to be seen if, when and to what extent national legislation will be adopted with respect to space-related activities.

V OUTLOOK AND CONCLUSIONS

There is a broad range of government-backed programmes, including financial subsidies, to promote a national space strategy. The DLR's activities cover a number of areas, including, but not limited to, Earth observation, satellite communications, navigation, space science and human space flight. The DLR and the Ministry also support various research and development activities based on the National Space Programme. State subsidies are granted for private space-related activities, such as research on space technology, space robotics, space transport systems, satellite-based telecommunications and navigation.

According to the national budget for 2019, the National Space Programme was allocated €285 million; the DLR received €522 million, which included funds for five new DLR institutes; and €857 million was allocated for international activities within the ESA, covering, among other things, the financing and the use and operation of the International Space Station. According to the Ministry, the various funds allocated to space-related activities significantly contribute to preserving a competitive German and European space industry.

At the same time, there is a growing New Space community in Germany. There are start-ups providing turnkey solutions for functional satellites and ground stations,³⁶ working to build lunar rovers and spacecraft to transport the rovers to the Moon,³⁷ and

36 German Orbital Systems, <http://www.orbitalsystems.de>.

37 PTScientists, <https://ptscientists.com>.

researching the production of fresh food in space,³⁸ to give just a few examples. However, the lack of national legislation facilitating private investment and commercial activities is seen as a major obstacle to the growth and competitiveness of the German space market. The adoption of investment-friendly legislation for private and commercial space activities thus remains a challenge.

38 Bake in Space, bakein.space.

JAPAN

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I INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

For over half a century, Japan has made intense efforts in the realm of space development, largely under the auspices of government initiatives. Japan became an original member of the Outer Space Treaty in 1967² and acceded to the following UN treaties on outer space in 1983: the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space; the Convention on International Liability for Damage Caused by Space Objects; and the Convention on Registration of Objects Launched into Outer Space. It concluded these treaties without implementing any domestic legislation.

Throughout this period, Japan sought to develop a launch vehicle using only domestic technology, and successfully launched its first domestic rocket, the H-II, in 1994. The H-IIA, an improved model of the H-II in terms of reliability and cost-efficiency, is Japan's current core rocket. The H-IIA and H-IIB³ rockets have recorded consecutive successful launches since 2005.

Japan has achieved success not only in the development of launch vehicles, but also in space exploration, such as with the Hayabusa Project, which attempted the first-ever return mission to collect samples from an asteroid, and the IKAROS Project, a small solar-powered sail spacecraft technology demonstration mission to explore a new solar electric sail technique.

While making progress in space activities, Japan has been relatively slow to implement domestic space legislation compared to other leading spacefaring countries. It enacted the Basic Space Law⁴ in 2008, creating a basic framework for space development and utilisation, and in 2016 enacted the Act on Launching of Spacecraft, etc. and Control of Spacecraft (the Space Activities Act),⁵ which establishes general rules for the launch and control of satellites.

In 1990, a private entity named Rocket Systems Corporation (RSC) was incorporated in Japan under the leadership of the government for the purpose of promoting commercial launch services using launch vehicles developed by the National Space Development Agency of Japan (NASDA; now the Japan Aerospace Exploration Agency (JAXA)) with the joint investment of Japanese space-related companies. In 1996, the RSC received 30 orders,

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2 The official name of the treaty is the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.

3 H-IIB is a derivative rocket of H-IIA that is capable of providing greater launch capacity. The main purpose of H-IIB is to transport cargo to the International Space Station.

4 Law No. 43 of 2008.

5 Law No. 76 of 2016.

including options for launching satellites, from two major US satellite manufacturers. The contracts were conditional on the RSC establishing a public compensation scheme for third-party damages. In response, a mandatory insurance scheme covering liabilities associated with the launch of the satellites and any third-party liability of NASDA was introduced under the law for the establishment of NASDA,⁶ rather than seeking to incorporate these provisions in a new space law. At the time, NASDA was the only entity with the ability to launch large-scale rockets, and this simple approach to legislating against liabilities proved adequate. However, the Japanese government expected that progress in the commercialisation of space-related activities would necessitate the establishment of a new space law and, almost 20 years later, the Space Activities Law was implemented.

Owing to a series of factors, such as delays in the development of the H-IIA, the cancellation of all orders received by the RSC, and the shrinkage⁷ of the commercial satellite market, commercialisation did not progress as quickly as initially envisioned in Japan, which dampened any sense of urgency in the implementation of space legislation. During this period, launch opportunities were almost exclusively available to the public sector. Other than the space agency, access to space activities was limited to long-established space manufacturers, known as 'Old Space' companies, such as Mitsubishi Heavy Industries, Ltd (MHI), IHI Aerospace Co, Ltd, Mitsubishi Electric Corporation and NEC Corporation.

The enactment of the Basic Space Law in 2008 was a significant turning point in the history of Japan's space development. It was the first national law making general provisions for space development and use in Japan. Unusually, it was the result of a non-partisan legislative effort.

From the early stages of space development, the government has restricted national space activities to peaceful purposes, long interpreted to mean non-military activities. As a consequence, prior to 2008, Japan maintained a national policy prohibiting the use of space for national defence, and Japanese space projects had been chiefly focused on research and development. However, in recognition of the global development of the space industry and its international circumstances, it was imperative for Japan to urgently expand its space activities. These developments resulted in a change in government policy to accept a wider range of space usage, including for defence, leading to the creation of the Basic Space Law. Under this Law, importance is given to the promotion of civilian uses of space, the strengthening of the Japanese space industry and its international competitiveness, and the assurance of space security.

Upon the enactment of the Basic Space Law, a structure for government oversight of space activities was created, with the establishment of the Strategic Headquarters for National Space Policy (the Headquarters) within the Cabinet, headed by the Prime Minister and with the participation of all Cabinet Ministers, as the highest decision-making body for national space policy. In 2013, the Headquarters published the Basic Plan on Space Policy,⁸ which is considered the master plan for government-sponsored space activities for the next decade.

6 The official name of the law is the Act on the National Space Development Agency of Japan (Law No. 50 of 1969).

7 Owing to the failures of the H-II's launch of flight 5 in 1998 and flight 8 in 1999, the RSC lost all the launch orders it had received, leading to the deterioration of its business and its ultimate dissolution in 2006.

8 Revised in 2016.

Further, in 2012, the National Space Policy Secretariat was created within the Cabinet Office, serving as the secretariat of the Headquarters and also playing the role of coordinator of space policies and space-related activities planned and implemented by various ministries. The Committee on National Space Policy was also formed in 2012 within the Cabinet Office as an adviser to the Headquarters, consisting of members from industry, academia and other experts.

These policy changes and government restructuring led to the enactment of the Space Activities Act in 2016, which is expected to promote the Japanese space industry (see Section II).

II REGULATION IN PRACTICE

The Space Activities Act was enacted in 2016 as a comprehensive law regulating two main space activities – launch and satellite⁹ operations. It sets out licensing requirements for those activities as well as special liability rules for damages arising from them.

i Licences required for space activities

Under the Space Activities Act, any person wishing to launch a satellite from Japan requires a licence from the government. Additionally, any satellite operator operating from Japan must obtain a separate licence. In reviewing these applications, the government evaluates technical aspects of the rockets and satellites as well as their purpose and use from various perspectives, including public safety and internationally agreed principles under space treaties. Details of the licence requirements for those activities are explained below. No special dispute resolution rules have been promulgated with respect to these licences. Accordingly, any appeal against the decisions relating to the grant of licences will be processed in accordance with general procedural rules under the Administrative Complaint Act of Japan.

Permission to launch

As noted above, any person who plans to launch a satellite from a launching facility located in the territory of Japan¹⁰ must obtain permission for each launch from the Prime Minister of Japan.¹¹ No permission is required for any launch from outside the territory of Japan (which may instead be subject to the licensing regime of the appropriate country). In addition, the launch of a rocket that does not carry a satellite is not considered to be the launch of a satellite and thus, for example, the test launch of a rocket that does not carry a payload does not require permission. Moreover, given the definition of ‘satellite’, the suborbital flight of a rocket that is not intended to deploy any space object into orbit or above is also outside the scope of the Space Activities Act.

In principle, permission for launch activity is given on a case-by-case basis. Typically, however, the same model of rocket is used multiple times over several years and it would be both onerous and inefficient if information regarding the design of the same model was

9 Under the Space Activities Act, a satellite is broadly defined as an artificial object to be deployed into orbit around the Earth or placed on an outer space object. Therefore, the Act covers a broad range of activities that involve any space object utilised in outer space.

10 More precisely, launches from a launch facility loaded on a vessel or aircraft registered in Japan are also subject to the permission requirement under the Space Activities Act.

11 Art. 4.1 of the Space Activities Act.

required to be evaluated with every application. Therefore, the Prime Minister has the power to certify a model of rocket upon request and the applicant for launch permission is not required to provide for governmental review any detailed information regarding the design of the certified rocket model.¹² Likewise, detailed information regarding the launch facility is not required for review if the launch facility has already been certified by the Prime Minister.¹³

The criteria for launch permission are as follows. First, the design of the rocket will be reviewed from the perspective of safety on the periphery of the flight path and the launch facility. As mentioned above, the process for the evaluation of the design will be simplified if a certified rocket model is used. Secondly, the launch facility is reviewed from the perspective of safety. For example, it must be equipped with radio equipment enabling the launch operator to identify the location of the rocket, and send commands to the rocket to discontinue the flight if it deviates from the scheduled flight path. Again, the evaluation of the launch facility may be simplified if the applicant is using a launch facility that has already been certified by the government. Thirdly, the government reviews the launch plan to ensure that it contains sufficient safety measures, and the applicant must show that it has sufficient capacity to implement the plan. Lastly, the purpose and use of satellites to be carried by the rocket must be in line with the fundamental principles of the Basic Space Law,¹⁴ and must not infringe on the treaties related to the development and use of outer space or the notion of public safety.

Permission to control satellites

Any person who plans to control and operate a satellite using a control facility (a satellite operating centre) located in the territory of Japan must obtain permission for each satellite.¹⁵ Similar to the regulation of launch activities, the Space Activities Act applies the principle of territorial jurisdiction to the regulation of satellite control; namely, only satellites controlled or operated from Japan are regulated, and satellite control from outside Japan is outside the scope of the Space Activities Act, regardless of whether it is conducted by a Japanese citizen or entity. Where a satellite is controlled by multiple control facilities located in more than one jurisdiction, permission is required if the main control function is located in Japan. There is no advance certification system for the design of satellites or control facilities.

The criteria for permission to be granted for satellite control focuses not only on public safety and compliance with the basic principles of domestic and international laws, but also closely on preventing the contamination of outer space and the Earth. First, the government reviews the purpose and use of the satellite to determine whether they are in line with the fundamental principles of the Basic Space Law,¹⁶ the treaties related to the development and use of outer space, and the notion of public safety. Secondly, the structure of the satellite must conform to standards separately promulgated by the government to prevent any harmful contamination of outer space and to ensure public safety. The main concern regarding

12 A similar privilege may be given to rockets that are certified by a foreign government designated by the Prime Minister of Japan, even if the model of rocket is not certified in Japan. Art. 6(1), Art 4.2(2) of the Space Activities Act.

13 Art. 16.1 of the Space Activities Act.

14 Such principles include (1) the peaceful use of outer space, (2) the enhancement of people's lives, (3) the promotion of industrial development, (4) the growth of human society, (5) international cooperation, and (6) consideration for the environment. Art. 2 to 7 of the Basic Space Law.

15 Art. 20 of the Space Activities Act.

16 See fn. 14.

harmful contamination of outer space is the generation of space debris arising from the satellite during and after its lifetime, which means the satellite must be structured in a way that prevents the release of fragments. It must also be structured with the aim of avoiding jeopardising public safety during and after its life, and to prevent the contamination of the Earth's environment or that of other celestial bodies. Thirdly, the satellite control plan must include measures to prevent any harmful contamination of outer space as well as end-of-life measures (as described below), and the applicant must show it has sufficient capacity to implement the plan.

End-of-life measures are required to be described in the control plan and implemented at the end of the satellite's operation. In principle, these measures must be any of the following: (1) de-orbiting and re-entry to Earth, with public safety at landing ensured; (2) deploying the satellite into 'graveyard orbit'; or (3) deploying the satellite into the orbit of another celestial body or allowing the satellite to fall into the celestial body. However, if any of the measures set forth in points (1) to (3) cannot be taken because of financial, technical or other constraints,¹⁷ then (4) cessation of control of the satellite after taking measures to prevent malfunction and explosion may be acceptable.

Radio station licence

A satellite operator must go through the process of international frequency coordination with the International Telecommunication Union in collaboration with the Ministry of Internal Affairs and Communications to be able to use radio frequency spectrum. At the same time, the satellite operator must obtain a domestic licence under the Radio Act¹⁸ to use the same frequency for each individual satellite and control facility. Owing to the scarcity of available frequencies, a domestic radio licence may only be granted to Japanese nationals or Japanese legal entities.

ii Special liability rules for space activities

The Space Activities Act established special civil liability rules for third-party damages caused by space activities. In establishing those rules, the lawmakers considered the necessity of protecting the public from inherently dangerous space activities, the extreme difficulty of victims being able to prove the negligence of a space operator that caused harm, and the principles applied to international liabilities under the Convention on International Liability for Damage Caused by Space Objects. In addition to these special liability rules, the Space Activities Act requires persons who launch a rocket to take financial measures to secure the payment of damages arising from the launch (typically, by purchasing space liability insurance and entering into a compensation agreement with the government).

Liability caused by launch activities

The Space Activities Act provides for a set of special liability rules for damage suffered by third parties caused by falls, collisions and the explosion of rockets after commencement of the launch operation. The rationale behind these special rules includes the following: the victim's ease in seeking compensation; the desirability of concentrating compensation obligations in

17 The typical satellite controller who may be eligible for this option is an individual in a university or scientific research institution who operates small satellites for scientific purposes.

18 Law No. 131 of 1950.

a single party that is required to purchase liability insurance; that suppliers of rocket parts will be encouraged to participate in the launch process because they will be released from the risk of significant liabilities; and, additionally, the desirability of promoting the international competitiveness of Japanese launch service providers.

The special liability rules are as follows:

- a Any person who launches satellites using a launching facility located within the territory of Japan¹⁹ shall be liable for damages to any third party located on the land, in the water or in a flying aircraft.²⁰ The liability of the launching party is strict and the injured third party does not need to prove negligence.
- b No person other than the launching party shall be liable to any third party for damages, as there is no application of product liability law.²¹ Consequently, third-party damages arising from launch activities are concentrated in the launching party.
- c A person who pays damages to a third party may claim a contribution from another person to whom the incident is attributable. However, where that person is a supplier of goods or services for the launch of satellites, that person shall be liable only if the damage is caused by its or its employees' wilful misconduct.²²

Security measures for third-party liability

Even if an applicant obtains launch permission from the government, it may not launch a satellite unless it implements measures to secure its liability for any damage caused to third parties by the launch activity and obtains approval from the government. The combination of space liability insurance provided by insurance companies and a supplemental compensation agreement with the government is one of these permitted measures. The launching party first needs to take out liability insurance cover with an insurance company covering the minimum amount of liabilities designated by the government.²³ The government then evaluates the sufficiency of the liability insurance and enters into a supplemental compensation agreement with the launching party to cover damages that are not covered by the liability insurance, up to a combined maximum of 350 billion yen. The supplemental compensation agreement will be provided free of charge.

Liabilities caused by satellite control

The first of the special liability rules (point (a) above) is also applied to the liability of satellite controllers for damage suffered by third parties owing to crashes and explosions of satellites occurring after separation from rockets. However, unlike the liability rules for damage caused by launch activities, a third party may also seek compensation from any other party to whose activities this damage may be attributable (i.e., the liabilities are not concentrated in the satellite controller), and there are no restrictions on claims for contribution. Further, satellite controllers are not required to take measures to secure third-party liabilities.

19 See fn. 10.

20 Art. 35 of the Space Activities Act. Damage to other satellites or other objects located in outer space are not within the scope of these special liability rules.

21 Art. 36 of the Space Activities Act.

22 Art. 38.1 of the Space Activities Act.

23 The required amount of coverage as at July 2019 is 20 billion yen for all types of rockets. Schedule to Art. 9-2 of the Regulation for Enforcement of the Act on Launching Artificial Satellites and Managing Satellites (Cabinet Ordinance No. 50 of 2017).

III DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

i Regulations on remote sensing business

Together with the general rules applicable to space activities that were codified under the Space Activities Act, Japan also enacted the Act on Securing Proper Handling of Satellite Remote Sensing Records (the Remote Sensing Act) concerning remote sensing activities, a major area of space activity that has become rapidly commercialised in recent years. While prospects for further growth in the remote sensing industry should be supported, the advancement of remote sensing technologies initiates concern from the perspective of both national and international security. The enactment of the Remote Sensing Act is intended to set clear rules for the use of remote sensing devices and data obtained from these devices, and for the provision and use of related products and services.

Under the Remote Sensing Act, any person who plans to use a ‘satellite remote sensing device’ using radio equipment located in Japan must obtain permission from the Prime Minister of Japan²⁴ for each device. The satellite remote sensing device is defined to include only remote sensing devices with a level of resolution designated by the government as the level at which potential security concerns arise.²⁵ Accordingly, remote sensing devices with a low resolution are outside the scope of the Remote Sensing Act. Additionally, permission is required only for remote sensing devices that are controlled from within the territory of Japan, and thus any such device controlled from outside Japan is not regulated under the Remote Sensing Act, even if the remote sensing device has the ability to detect locations in Japan.

To obtain permission, the user of a remote sensing device must implement measures to prevent the unauthorised use of the device and the divulgence of remote sensing data, including the encryption of information exchanged between the remote sensing device and the ground facility. The user must also show that it has sufficient capacity to carry out these measures, and that the use of the remote sensing device is not against principles of international peace or national security.²⁶

If the satellite for which permission to use the remote sensing device is granted deploys out of the permitted orbit, the user must cease remote sensing until the satellite returns to the planned orbit.²⁷ When the user terminates the use of the remote sensing device, it must implement measures to prevent the unauthorised use of the device by completely ceasing the transmission of signals from the device or suspending transmission until a rebooting signal is received.²⁸

The Remote Sensing Act also regulates the provision of remote sensing data that are highly sensitive from a security perspective. Satellite remote sensing information may not be provided to any person that has not obtained a licence to handle that information.

ii Foreign trade regulations

The technologies related to the development of outer space are subject to both export and import control regulations under the Foreign Exchange and Foreign Trade Act of Japan.

24 Art. 4.1 of the Remote Sensing Act.

25 Art. 2(2) of the Remote Sensing Act. For example, the designated resolution of an optical sensor is 2 metres.

26 Art. 6 of the Remote Sensing Act.

27 Art. 9 of the Remote Sensing Act.

28 Art. 15.2 of the Remote Sensing Act.

The government provides a list of regulated products, the export (or the provision of related technologies) of which to prescribed foreign countries or areas requires prior permission. Many of the products listed are relevant to national security and, accordingly, a number of technologies relevant to rockets and satellites are subject to export control regulations.

A prior filing with the government may also be required for the introduction of certain technologies related to the development of outer space by a non-resident of Japan. The requirements for importing technology include any necessary transfer and licensing of intellectual property rights and other manufacturing and processing technologies.

IV CURRENT DEVELOPMENTS

Like other nations, the government occupies a dominant position in Japan's space activities, and, in collaboration with the government, Old Space companies (see Section I) have engaged in space development and have satisfied public requirements and expectations with the support of government funds. While Old Space companies are still major players, small and medium-sized space ventures (part of 'New Space') are gradually growing their businesses with government backing, and are expected to be active players in the space industry in the near future.

In 2017, the government published its Space Industry Vision 2030, which sets a target of doubling the size of the space industry by the early 2030s, and aims to boost New Space technologies with strong government support. JAXA is increasingly expected to transfer its research and development outcomes to the private sector, and provide private companies with technological support and opportunities to improve their capabilities. Some recent examples of these developments are outlined below.

i Privatisation of launch operations

While Japan's domestic rocket business has largely depended on national public demand, the government calls for greater emphasis on private-sector demand and the global launch business. Under national policy, in 2007, following NASDA's 13th flight, MHI replaced NASDA (now JAXA) as the operator of H-IIA launch operations, and commenced its own commercial launch services. JAXA grants an exclusive licence to MHI to manufacture and launch the H-IIA. Following the transfer of H-IIA launch operations, MHI also assumed responsibility for H-IIB launch operations from JAXA, following its fourth flight in 2013. JAXA continues to be responsible for the overall safety management of launches, to ensure safety on the ground, in the ocean and during flights, even after the transfer of the launch operations.

Today, JAXA, with satellites to launch, has entered into a launch service agreement with MHI to purchase launch services from it. Although the H-IIA and the H-IIB have enough safe and successful flight records, MHI has been required to obtain approvals for these rockets from the government under the Space Activities Act since 15 November 2018.

Currently, the H-III is under development to be a successor to the H-IIA, aiming at high cost performance and greater competitive strength. Further, the Epsilon rocket, a solid-propellant launch vehicle, has also been developed by JAXA with the objective of allowing a more flexible and efficient response to the expanding launch demands of smaller satellites. The launch operations of these rockets are also intended to be transferred to the private sector to promote commercial launch services by JAXA.

ii Support for new business creation

The limited availability and high costs associated with the deployment of launch vehicles present hurdles to the participation in on-orbit demonstrations or outer space experiments by space ventures. JAXA promotes projects that make these opportunities to support new business development inexpensive and readily available to the private sector and universities.

JAXA launches small or ultra-small satellites developed by the private sector and universities as 'piggyback satellites'²⁹ riding free of charge on an Epsilon rocket, and provides them opportunities for on-orbit demonstrations of new element technologies using these small satellites as test beds. Although some restrictions are placed on the choice of timing for a launch, these are invaluable opportunities for space ventures to demonstrate new technologies in on-orbit vacuum environments without bearing launch costs.

JAXA also promotes commercial utilisation of the International Space Station (ISS) and offers services of applied research experiments on 'Kibo', the Japanese Experiment Module of the ISS, to contribute to many new developments related to, among others, drugs, materials and medical equipment, which will generate new businesses and improve the quality of life. In addition to non-proprietary experiments selected through public invitation on a no-fee basis, JAXA provides a paid utilisation framework for carrying out experiments, where the outcomes are proprietary, to encourage the participation of private-sector players and universities.

The government supports a number of projects to cultivate the New Space movement, including the 'S-Matching', a platform facilitating the networking of space business entrepreneurs and investors, Space New Economy, 'S-Net', a networking activity to support New Space businesses, and 'S-booster', a contest to award good space business ideas. In addition, government investment banks and funds, such as the Development Bank of Japan and Innovation Network Corporation of Japan, affirmatively invest in New Space businesses.

iii Attempted new style of project

JAXA is attempting to introduce a new style of project, along the lines of NASA's programmes, such as its Commercial Orbital Transportation Services, to provide new motivation for the private sector and achieve maximum performance. It is also expected to make more efficient use of JAXA's tight budgets and human resources.

Currently, one of the most serious space issues is how to tackle increasing space debris. JAXA intends to demonstrate its technology for the removal of space debris using the private sector's ideas and technological capabilities. As part of this project, JAXA will select a private company as a project partner, to be responsible for the entire project and to formulate a business plan meeting JAXA's requirements, procure and operate a satellite system, carry out an on-orbit demonstration and obtain data. It is expected that the costs of the project will be divided equally between JAXA and the company. In addition to providing technical advice and licensing its intellectual properties, JAXA will only serve as a fund provider to the project by way of milestone payments and will be entitled to use the demonstration data free of charge. The company will be entitled to reserve proprietary rights in the outcomes of the project and will be encouraged to use these outcomes for commercial purposes and for its own proprietary business development.

29 A piggyback satellite launch utilises the excessive launch capability of the rocket to launch small satellites.

V OUTLOOK AND CONCLUSIONS

Although the basic legal framework and government structure for expanding space utilisation and developing space industries in Japan has developed, the process leading to this was slower than initially expected. The opportunities now exist to enhance the function and capabilities of Japan's legal and government structure by bringing together true expertise, knowledge and experience sufficient to meet the demands of the space industry and enable the country to compete internationally. Constant review of the space laws is necessary to ensure their functionality and effectiveness, and to avoid impeding the growth of the industry.

LUXEMBOURG

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I INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

Luxembourg established itself very early on as a state fostering entrepreneurship and the development of commercial activities in the space sector. By supporting the creation of SES, one of the biggest satellite operators in the world, and by creating legislation specific to the transmission of satellite services shortly thereafter, Luxembourg has demonstrated its ability to build a favourable environment for the structural development of activities related to the use of outer space.

Luxembourg is party to the following United Nations space treaties: the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty), signed in 1967 and ratified on 17 January 2006; the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (the Rescue Agreement), signed in 1968 but not yet ratified;² and the Convention on International Liability for Damage Caused by Space Objects, signed in 1972 and ratified on 9 June 1983.

The Convention on Registration of Objects Launched into Outer Space (the Registration Convention) and the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies (the Moon Agreement) have neither been signed nor ratified by Luxembourg. However, a draft bill of law³ is currently being debated in the parliament and the ratification of the Registration Convention may still occur in 2019.

Luxembourg currently notifies all Luxembourg-registered space objects, on the basis of United Nations General Assembly Resolution No. 1721 B (XVI) of 20 December 1961, to the United Nations Office for Outer Space Affairs. Furthermore, given Luxembourg's intention to ratify the Registration Convention, there is a proposal to create a national registry of space objects to comply with the terms of the Convention.

From an institutional standpoint, Luxembourg has always benefited from governmental impetus in setting new policy standards. In this respect, the Ministry of the Economy initiated the creation of the Luxembourg Space Agency in 2018. The Agency is a department of the Ministry of the Economy and, unlike the space agencies of the other major spacefaring European countries, it does not have independent status. Under the authority of the Ministry of the Economy, the mission of the Luxembourg Space Agency is to promote the economic

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2 The ratification of the Rescue Agreement is currently being considered by the Luxembourg parliament.

3 Draft Bill of Law No. 7270 on the ratification of the Registration Convention.

development of the space sector in Luxembourg by providing support to the space industry, attracting new businesses, developing talent, offering innovative financial solutions, and supporting academic learning and research.

II REGULATION IN PRACTICE

The Law of 27 July 1991 on electronic media applicable to the operation of a Luxembourg satellite system and the transmission of services by satellite (the Electronic Media Law), the Law of 30 May 2005 on the organisation of the management of frequency bands (the Frequency Bands Law) and the Law of 20 July 2017 on the exploration and use of space resources (the Space Resources Law) are the main pieces of legislation applicable to the space industry.

According to the provisions of the Electronic Media Law, no one can establish and operate a Luxembourg satellite system without first obtaining a licence (concession), granted by the government, upon the joint proposal of the Minister in charge of telecommunications and the Minister in charge of media. The national concession creates a legal nexus between Luxembourg and the licensee (concessionaire) for the implementation of Luxembourg satellite systems.

In connection with the concession and the constant necessity to monitor the space activities of Luxembourg operators (resulting from Luxembourg's international obligations), the Electronic Media Law sets a number of criteria that must be fulfilled by any operator at all times. In particular, Article 21 of the Electronic Media Law contains a non-exhaustive list of conditions that must be respected by the concessionaire. These requirements relate, among other things, to: (1) the government's right to inspect the concessionaire's articles of association, shareholding and management; (2) the conditions under which the concessionaire may make its transmission capacity available to users (and the government has the right to express its opposition to the choice of users); and (3) the conditions for the supervision of the concessionaire's activity by one or more government commissioners.

In addition, the Electronic Media Law provides for a list of specifications, which may include any additional requirements to be duly observed by the concessionaire and by the concessionaire's customers at any time. These specifications remain confidential and are adapted to the context in which each concession is awarded.

The concession is personal and non-assignable (neither against payment nor for free). It may include elements of exclusivity in the use of certain frequency bands or orbital positions, or for certain types of applications in the field of satellite telecommunications. The period of the concession is limited, but renewable.

In accordance with the provisions of Article 35 *sexies* of the Electronic Media Law the concession may be withdrawn if (1) the conditions required to obtain it are not being met, (2) the obligations set out in the specifications are not met or (3) it is not regularly operated, in accordance with the procedures laid down.

The transmission of Luxembourg services by satellite is subject to a second licence (services concession), distinct from the concession required for the establishment and operation of a Luxembourg satellite system. The services concession may be obtained upon the proposal of the Minister in charge of media and after consultation with the Luxembourg Independent Audiovisual Authority (the Audiovisual Authority).

Only legal persons governed by Luxembourg law may apply for a services concession. A set of specifications must be complied with to apply for this concession and these may be adapted according to the number of services offered by the applicant. Each specification may contain provisions on:

- a* the monitoring of the services;
- b* the government's right to inspect the operator's articles of association, shareholding and management and those of all companies involved in the operation of the services concession;
- c* the supervision of the activity of the licensed operator by one or more government commissioners; and
- d* the obligation for the operator to identify itself as a Luxembourg organisation and to contribute, through its services, to the reputation of Luxembourg.

The services concession is personal, non-assignable (neither against payment nor for free) and applies for a limited period, but is renewable. It may be withdrawn at any time in accordance with the provisions of Article 35 *sexies* if the conditions required to obtain it are no longer being met or the obligations set out in the specifications are not being met.

When the Audiovisual Authority becomes aware, either of its own volition or through a complaint, of a breach by a concession holder or a services concession holder of a provision of (1) the Electronic Media Law, (2) one of the regulations adopted pursuant to the Electronic Media Law or (3) the concession or services concession specifications, it will invite the operator to provide an explanation within one year of the breach occurring. Depending on the seriousness of the breach, it may impose disciplinary sanctions ranging from a reprimand to a fine of up to €25,000. If, subsequently, the operator does not comply with the Electronic Media Law or if it commits a repeat offence within six months of the imposed sanction, it may be fined up to €50,000. If the operator is a services concession holder, the Audiovisual Authority may propose the temporary suspension or withdrawal of the services concession and the government will ultimately decide on the sanction. The operator can appeal against the decision of the Audiovisual Authority to the Administrative Tribunal. The administrative judge may make a final decision and validate or reject the appeal.

In addition, in accordance with the Frequency Bands Law, in Luxembourg or on board a ship, boat, aircraft or any other medium subject to Luxembourg law, frequency bands may not be used without the prior authorisation of the Minister in charge of the management of frequency bands, who allocates frequency bands according to an allotment and frequency band allocation plan. The assignment of frequency bands is recorded in a public ledger called the frequencies register, which provides information on the obligations associated with frequency bands. Access to this register may be limited at the discretion of the Minister in charge of frequency bands.

The frequency allocation procedure is carried out according to objective criteria, and in a transparent manner in accordance with the frequency bands allocation plan and the Radio Regulations of the International Telecommunications Union. Where several undertakings apply for authorisation to use the same frequency or frequencies exclusively, the relevant licences shall be granted by the Minister through a public call for applications to the highest bidder, either by competitive or comparative selection. This also applies to satellite spectrum.

The obligations of the frequency licence holder are, among other things, to: (1) provide a service or use a type of technology for which frequency rights have been granted, including, where applicable, coverage and quality requirements; and (2) establish the technical and

operational conditions necessary to avoid harmful interference. Failure to fulfil these obligations carries the penalty of a fine, which can be up to €25,000 for legal persons. The Minister may also temporarily or permanently withdraw the frequency licence. The maximum fine may be doubled in the event of a repeated offence.

In the context of the growing interest in the exploration and use of outer-space resources, Luxembourg has decided to reinforce its position as a European hub for space exploration activities and to offer a legal and regulatory framework to authorise, support and monitor space exploration missions and activities.

The Space Resources Law entered into force on 1 August 2017. In accordance with its provisions, space resources may not be explored or used without a written mission authorisation from the Ministers in charge of the economy and space activities. The authorisation is granted for commercial purposes only on written application by a space resources operator, which must be a Luxembourg-based company incorporated under one of the following legal forms: a public company limited by shares; a corporate partnership limited by shares; a private limited liability company; or a European company. The authorisation is personal and non-assignable (neither against payment nor for free) and may be granted to an operator with respect to one single mission.

The authorisation is subject to: (1) the production of evidence showing the existence in Luxembourg of the central administration and of the registered office, including the administrative and accounting structures of the operator to be authorised; (2) the communication to the Ministers of the identities of the direct or indirect shareholders or members,⁴ regardless of whether they are natural or legal persons, that have direct or indirect holdings of at least 10 per cent of the capital or of the voting rights in the operator, or, if the 10 per cent threshold is not met, the identities of the 20 largest shareholders or members; and (3) the submission for review of the risk assessment for the mission. The authorisation is also conditional on: (1) the confirmation that the annual accounts will be audited by one or more independent auditors; (2) the appointment of at least two persons for the management of the operator with adequate professional experience; and (3) the payment of a fee set by the Ministers to cover the administrative expenses incurred in relation to the processing of the application (which is between €5,000 and €500,000 depending on the complexity of the application and the amount of work involved). The scope of the above-mentioned conditions is not exhaustive as the legislator has empowered the government with the right to impose additional conditions on a case-by-case basis.

The authorisation will be refused if, taking into account the need to ensure a sound and prudent operation, the shareholders or members are found to be unsuitable. If any assessed person is replaced, the change must be communicated in advance to the Ministers who may request all information as may be necessary regarding the persons to be appointed with respect to their good repute and professional experience. The Ministers will refuse the proposed change if these persons are not of adequate professional repute or do not have sufficient professional experience, or where there are objective and demonstrable grounds for believing that the proposed change would pose a threat to the sound and prudent management of the operations.

Given the high risks involved with space exploration activity, the Space Resources Law also requires financial assets from the space operator that should be appropriate to the risk of the mission (although it is not further defined what the term ‘appropriate’ covers in practice).

⁴ Members means ‘Members of a board of directors, a board of managers or any related management body of the operator’.

In addition, the risks may be covered by one of the following: (1) the financial resources of the space operator; (2) an insurance policy; or (3) a guarantee from a bank. An insurance policy does not constitute a *sine qua non* condition for the authorisation if the operator is able to cover its risks by other means. However, the Law does not specify what type of guarantees could qualify. In any case, the operator should not be part of the same group of companies as the insurer or guarantor.

The Space Resources Law also lists the circumstances in which the authorisation should be withdrawn. In particular:

- a* the mission has ended or been modified;
- b* the operator has entered into liquidation;
- c* the operator has failed to use the authorisation for over 36 months;
- d* the operator no longer meets the criteria of the authorisation; or
- e* the authorisation was granted based on inaccurate statements made by the operator.

Anyone who explores and uses space resources without validly granted authorisation for such mission is subject to between eight days' and five years' imprisonment or a fine of between €5,000 and €1.25 million, or both. Any person that contravenes or attempts to contravene the provisions of the articles by failing to communicate to the Ministers changes relating to the management or the appointment of an independent auditor, or that contravenes the terms and conditions of the authorisation (including its non-assignability), will be sanctioned with imprisonment of between eight days and one year or a fine of between €1,250 and €500,000, or both. The court to which the matter is being referred may declare the termination of an operation contravening the provisions of the Space Resources Law, under a penalty that shall not exceed €1 million per day of infringement.

III DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

The distinctive characteristic of the national space legal framework derives from the Space Resources Law. Luxembourg also implemented the Law of 27 June 2018 on the control of the export, transfer, transit and import of strictly civilian goods, defence-related products and dual-use items (the Export Control Law).

Following the launch of the space resources initiative in 2016, the Luxembourg legislator adopted the Space Resources Law in 2017, introducing a new element by stating that space resources⁵ are capable of being appropriated. The new law follows the model established in 2015 by the US Space Act.⁶ The enactment of the Space Resources Law was a significant event and brought Luxembourg to the attention of the global space community.

5 Space resources are commonly defined as abiotic resources found in situ in outer space, which can be extracted. This definition excludes satellite orbits and radio spectrum, as well as energy from the sun, and magnetic fields and related gravity].

6 51 USC 51303: 'A United States citizen engaged in commercial recovery of an asteroid resource or a space resource under this chapter shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell the asteroid resource or space resource obtained in accordance with applicable law, including the international obligations of the United States.'

The Space Resources Law reopened a debate regarding the link between two important principles of the Outer Space Treaty: the freedom to use outer space and the non-appropriation of outer space. The Space Resources Law considers the possibility of owning space resources as one of the applications of the freedom to use outer space guaranteed by the Outer Space Treaty.

As mentioned above, Article 1 of the Space Resources Law provides that ‘space resources are capable of being appropriated’. To substantiate this reasoning, the Luxembourg legislator, among others, made an analogy using the rules governing the high seas and the possibility that exists of exploring marine resources without appropriating the high seas, as such. Although the Outer Space Treaty defines and forbids the appropriation of the Moon or any other celestial bodies, it does not prevent the appropriation of outer space resources, as such. The legislator, in its commentary to Article 1 of the Space Resources Law, points out that the wording used excludes any possibility of contradicting the provisions of Article 2 of the Outer Space Treaty in that (1) it does not allow the appropriation of asteroids, comets or celestial bodies, and (2) it does not allow or does not constitute ‘a commencement of a component of sovereignty over a territory above a celestial body or any part whatsoever of outer space and the other celestial bodies’.⁷ In addition, as mentioned in Section II, anyone who explores and uses space resources without government authorisation is subject to imprisonment or a fine, or both.

As Luxembourg (like the majority of spacefaring nations) has neither signed nor ratified the Moon Agreement, it is not subject to its restrictive provisions, which intend to make the appropriation of the resources on the surface or the subsurface of the Moon (and per extension, on any celestial bodies within the solar system) dependent on prior establishment of an international legal framework for that purpose. Despite compliance with international standards, the effectiveness of the Space Resources Law and its recognition by some third countries⁸ is under debate. Some scholars consider that the resources to be extracted in outer space are global commons under the jurisdiction of the international community and that the regulatory framework should not be left to the unilateral legislation of different states. The position of the Luxembourg legislator is to consider, however, that as long as the national legislation complies with the existing international legal framework, the question of the appropriation of outer space resources may be left to the discretion of national legislatures.

Contrary to the US Space Act, the Space Resources Law is unique in that it does not require the shareholding of the operator applying for an authorisation to be exclusively composed of Luxembourg companies or Luxembourg citizens. Thus, a 100 per cent non-Luxembourg shareholding is acceptable, provided that the operator for which the authorisation is issued is a Luxembourg legal person that has its registered office in Luxembourg and abides by all other relevant conditions.

Trade in dual-use goods and technology is not a priori prohibited in Luxembourg but is subject to controls by the Office of Export, Import and Transit Control (the EITC Office)⁹ of the Ministry of the Economy on export and transit through the European Union to ensure against the proliferation of weapons, based on the Export Control Law and Council Regulation (EC) No. 428/2009. Insofar as space object components are considered to be dual-use goods, persons wishing to export, transfer, import or transit these goods must first

7 Rapport de la Commission de l’Economie, 6 June 2017.

8 Mainly signatories to the Moon Agreement.

9 The EITC Office was created by the Grand-Ducal Regulation on controls on import, export and transit of dual-use goods, defence-related products and diamonds, which entered into force on 24 December 2018.

request an authorisation from the Ministries responsible for foreign trade and foreign affairs via a request addressed to the EITC Office. Applications for authorisation must include all the details identifying the parties involved in the transaction, the precise description of the goods concerned, and their origin, final destination, final use, quantities and values covered by the application. Requests for authorisation must be accompanied by one or more of the documents listed in the relevant regulation, depending on the property and the proposed transaction. Authorisations will be issued after an assessment of the degree of sensitivity of the transfer, based, in particular, on: (1) the nature of the components in relation to the products in which they are to be incorporated and in relation to any end use of the finished products that may give rise to concern; and (2) the importance of the components in relation to the products in which they are incorporated. Ministers do not impose export restrictions on components where the product recipient submits a declaration of use stating that the components covered by the transfer authorisation are or must be incorporated into its own products and may therefore not be transferred or exported subsequently as such, except for the purpose of maintenance or repair.

The authorisation must be issued in individual, global or general form. The individual authorisation is issued to an individual operator and authorises an operation involving a specified quantity of goods and taking place in one or more stages. The global authorisation may be used by an operator that complies with the conditions indicated in the authorisation to carry out operations for goods covered by the Export Control Law either: (1) to recipients located in one or more Member States of the European Union, in a transfer of defence-related products; or (2) from or to third countries or to identified persons, as indicated in the global authorisation. It will cover, for its period of validity, the export, transfer, import or transit of the identified goods. The general authorisation may be used by all operators that are established or resident in Luxembourg and that comply with the conditions indicated in the authorisation to carry out transactions for goods covered by the Export Control Law to or from states outside the European Union or identified persons, as indicated in the general authorisation.

Individual authorisations are valid for one year and are renewable by express ministerial decision for a further six months, and global and general authorisations are valid for three years and are renewable, under the same terms and conditions, for a further 18 months.

Legal entities and natural persons covered by the provisions of the Export Control Law may be sanctioned by the Minister responsible for foreign trade in the event that they:

- a* refuse to provide documents or other information requested by the Minister or the EITC Office;
- b* have provided the Minister or the EITC Office with documents or other information that is found to be incomplete or incorrect;
- c* interfere with the exercise of the powers of the Minister or the EITC Office; or
- d* do not comply with instructions from the Minister or the EITC Office.

Consequently, the Minister may impose the following: a prohibition limited to six months or an indefinite prohibition in respect of carrying out one or more activities that are subject to the Export Control Law, as well as any other restrictions on the activity of the legal or natural person; or a suspension for a maximum of six months from the use of a general authorisation from the European Union or national authorities, or a global authorisation. There may be additional sanctions of imprisonment for five to 10 years and a fine of €25,000 to €1 million.

IV CURRENT DEVELOPMENTS

The development of the Luxembourg space sector has always been driven by commercial activities related to the space sector and Luxembourg has adopted a framework in line with the progress made by private-sector companies. It was owing to the provision of a legal framework for the activities of SES that Luxembourg adopted the Electronic Media Law (see Section II). Subsequently, the provision of a favourable environment for companies whose purpose was the exploration and use of outer space resources was the catalyst for the Space Resources Law. The legislator now intends to create a general framework applicable to all space activities and to group together the existing legislative texts to enable companies operating in the space sector, with the exception of space resources operators, to have at their disposal a single piece of legislation that clearly defines the cases in which Luxembourg will incur liability in relation to space activities (the Space Activities Draft Bill).¹⁰

The Space Activities Draft Bill is intended to create the *lex generalis* for space activities and will apply, as indicated in its Article 1, to space activities carried out (1) from the territory of Luxembourg or by means of installations, whether movable or immovable, which are under the jurisdiction or control of Luxembourg, (2) and elsewhere by Luxembourg nationals or legal persons governed by Luxembourg law with the exception of the provisions on the missions of exploration and use of outer space resources, governed by the Space Resources Law.

According to the Space Activities Draft Bill, no operator will be allowed to perform a space activity without prior authorisation from the Minister in charge of space legislation. An additional launch authorisation will also be needed for an operator that plans to launch an object into outer space.¹¹

In addition to the general procedures for obtaining prior authorisation, the Space Activities Draft Bill echoes UN Resolution 55/122 and the European Union's International Code of Conduct for Outer Space Activities by formulating an Article on environmental protection, emphasising that any operator must take the necessary measures to limit the risks of degradation of space and terrestrial environments or their contamination and the risks associated with space debris.¹² It is also an opportunity for Luxembourg to create a national register of space objects, in accordance with its accession to the Registration Convention. Since this register was not mentioned in the Space Resources Law, the Space Activities Draft Bill proposes to extend the obligation to register objects launched into outer space to all objects, including those mentioned in the Space Resources Law.

The Space Activities Draft Bill is expected to be adopted by the Luxembourg parliament in 2019 or 2020.

10 The authors of the Space Activities Draft Bill point out, in this respect, that 'the concession regime provided for by [the Electronic Media Law] only applies in the event that the concessionaire is granted the right to use Luxembourg frequencies. Thus an operator established in Luxembourg who does not request the right to use Luxembourg frequencies, because it uses frequencies allocated by another State, could currently launch a space object without any authorisation from the Luxembourg State.'

11 However, the Chamber of Commerce opinion dated 19 November 2018 and the Council of State opinion dated 15 February 2019 suggest that the number of authorisations required to perform space activities should be limited as much as possible, for administrative streamlining and for the sake of business attractiveness.

12 Article 4, Space Activities Draft Bill.

V OUTLOOK AND CONCLUSIONS

The space sector is one of the priority sectors that Luxembourg, in part owing to its geopolitical neutrality and political stability, has constantly promoted since its entry into the space industry more than 35 years ago, and it continues to develop.

Over the past three years, a significant number of projects have flourished with a view to promoting and strengthening Luxembourg's attractiveness on the international scene, including the following:

- a* as a Member State of the European Space Agency, Luxembourg established the Luxembourg Space Agency on 12 September 2018 for the economic development of space and activities related to the new space sector;
- b* the University of Luxembourg announced the launch of a two-year 'Interdisciplinary Space Master' for the 2019 academic year in line with the government's space initiative; and
- c* the Luxembourg Institute of Science and Technology has developed multiple space-related departments, including the Environmental Research and Innovation department, the IT for Innovative Services department and the Materials Research and Technology department.

Through the efforts made to establish a business environment conducive to commercial activities, and the establishment of an institutional, financial and commercial framework in line with business expectations, Luxembourg is positioning itself as a facilitator, and increasingly as an important player, in the space industry.

NEW ZEALAND

*Simon Martin*¹

I INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

i Background to the space law framework

New Zealand's space law regime is a recent development. While New Zealand ratified some of the core United Nations (UN) space treaties in the 1960s and 1970s (see subsection iii), it did not have a dedicated space agency until 2016 and did not have dedicated space legislation until 2017.

In 2016 the company Rocket Lab, which was founded in New Zealand but which had moved its operations to the United States, indicated its intention to establish a commercial space launch business in New Zealand. To take advantage of this opportunity, the New Zealand government initiated the process of developing the country's first space policy.

At the outset, the government's policy objectives were focused on ensuring that New Zealand met its obligations as a launching state under the international treaties, while also capitalising on the economic opportunities associated with the commercial space launch industry.²

The government's policy review culminated in the introduction of the Outer Space and High-altitude Activities Bill (the Outer Space Bill) in June 2016. The Outer Space Bill was designed to create a certain and predictable, yet flexible, space law regime that contained the minimum regulation needed to comply with New Zealand's international obligations.³

On 21 December 2017, the Outer Space and High-altitude Activities Act 2017 (the Outer Space Act) came into force and established New Zealand's first regime for the registration, licensing and operation of launch vehicles, payloads and high-altitude vehicles (HAVs).

Rocket Lab has now established the world's first private orbital launch range on the Mahia Peninsula in New Zealand, and the company completed its first commercial launch on 11 November 2018.

1 Simon Martin is a partner at Hudson Gavin Martin. The author would like to thank Ashleigh Ooi for her contribution to this chapter.

2 Cabinet Economic Growth and Infrastructure Committee Minute of Decision, 'The Scope of Space Policy and a Lead Space Agency' (April 2016).

3 Ministry of Business, Innovation and Employment Regulatory Impact Statement: Outer Space and High Altitude Activities Bill (June 2016).

ii Current framework

The Outer Space Act governs the launch of space objects in New Zealand. It is supplemented by two sets of regulations: the Outer Space and High-altitude Activities (Licences and Permits) Regulations 2017 (the Licensing Regulations); and the Outer Space and High-altitude Activities (Definition of High-altitude Vehicle) Regulations 2017 (the HAV Regulations). The Act and both sets of Regulations are administered by the New Zealand Space Agency, a department of the Ministry of Business, Innovation and Employment (MBIE), which has been operating since 2016.

Rocket Lab's operations in New Zealand are governed by the following agreements:

- a* the Agreement between the Government of New Zealand and the Government of the United States of America on Technology Safeguards Associated with United States Participation in Space Launches from New Zealand (commonly known as the Technology Safeguards Agreement (TSA)),⁴ which was signed in June 2016 as a prerequisite for the establishment of Rocket Lab's commercial space launch operations in New Zealand; and
- b* the Agreement between the New Zealand Government and Rocket Lab Ltd and Rocket Lab USA Inc dated 16 September 2016 (the Rocket Lab Agreement), which was entered into to allow Rocket Lab to commence space launches while the Outer Space Act was still in the legislative process, and mirrors the rights, powers, authorities and obligations in the Outer Space Act (as well as incorporating relevant requirements from the TSA).

The Outer Space Act provides that the Rocket Lab Agreement is to be treated as a launch licence and a facility licence, although both licences will expire (1) six months after the commencement of the Outer Space Act, being 21 June 2018 (the expiry of the transition period) or (2) if Rocket Lab applies for licences under the Outer Space Act before the expiry of the transition period, on the date on which the relevant Minister (the Minister) grants or declines to grant a licence. Rocket Lab is currently in the process of obtaining the relevant licences.

New Zealand is also party to the Arrangement between the European Space Agency and the Government of New Zealand on the setting up and use of telemetry and tracking facilities for the purpose of the Agency's launcher programmes and activities, which was signed in March 2007 and renewed in 2017.

iii International law

New Zealand has ratified four UN space treaties:

- a* the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (the Outer Space Treaty), ratified on 31 May 1968;
- b* the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space (Rescue Agreement), ratified on 8 July 1969;
- c* the Convention on International Liability for Damage Caused by Space Objects (the Liability Convention), ratified on 30 October 1974; and

⁴ See also the corresponding Arrangement between the Government of New Zealand and the Government of the United States of America relating to the Agreement between the Government of New Zealand and the Government of the United States of America on Technology Safeguards Associated with United States Participation in Space Launches from New Zealand.

- d* the Convention on Registration of Objects Launched into Outer Space (the Registration Convention), acceded to on 23 January 2018.

Like many other countries, New Zealand is not party to the Agreement Governing the Activities of States on the Moon and Other Celestial Bodies.

New Zealand takes a dualist approach to international treaties, which means treaties do not have the force of domestic law until incorporated into domestic legislation. When New Zealand signed the core UN treaties it did not have a space launch industry, nor an operations industry, and there was accordingly no need to consider how its treaty obligations would be accounted for in the domestic framework (with the exception of the Registration Convention).

However, the rapid enactment of the Outer Space Act, supplemented by the Rocket Lab Agreement, suggests that the government did view these obligations as binding and sought to enforce the provisions of the Outer Space Treaty and Liability Convention through the Outer Space Act and, to the extent the legislative process was unable to keep up with Rocket Lab's plans, the Rocket Lab Agreement.

The Outer Space Act makes reference to the Outer Space Treaty, the Liability Convention and the Registration Convention; it acknowledges the government's potential liability under the Outer Space Treaty and the Liability Convention, and describes the Act's purpose as including the implementation of the obligations in the Outer Space Treaty not to:⁵

- a* place in orbit around the Earth any objects carrying nuclear weapons or weapons of mass destruction, install these weapons on celestial bodies or station them in outer space in any other manner;
- b* establish military bases, installations or fortifications on celestial bodies; or
- c* test any types of weapons or conduct manoeuvres on celestial bodies.

New Zealand has been a member of the United Nations Committee on the Peaceful Uses of Outer Space since December 2016 and is also a member of the International Telecommunication Union (ITU).

II REGULATION IN PRACTICE

i Outer Space Act

The Outer Space Act regulates the launch of launch vehicles, payloads and HAVs from New Zealand. The Outer Space Act is modelled on New Zealand's obligations under the Outer Space Treaty, the Liability Convention and the Registration Convention, and establishes a regime for regulating space activities in accordance with these international obligations.

The Outer Space Act provides for four types of licences or permits: launch licences; payload permits; facility licences; and high-altitude licences. The Licensing Regulations contain more detailed requirements for the content of each licence and permit application.

Licences and permits must be obtained for launches conducted from New Zealand, or from outside New Zealand by New Zealand nationals. The government considers that its international liability for national activities in outer space (under the Outer Space Treaty)

⁵ Outer Space Act, s 3.

extends to activities carried out from its territories or by its nationals. Accordingly, all space activities by New Zealand nationals must be licensed and the government will actively monitor overseas launches, including through its relationships with international regulators.

The Outer Space Act allows the Minister to take into account a licence, permit or other authorisation obtained overseas when determining whether to grant a licence or permit in New Zealand. The Minister may treat an overseas authorisation as satisfying some or all of the criteria for granting a launch licence, payload permit or facility licence.⁶

Applications for licences and permits must be made with the New Zealand Space Agency. There is no specified process for appealing a licensing decision made by the Agency. As such, an applicant may need to rely on the usual rights of judicial review to formally challenge a decision.

Launch licences

Launch licences are required for the launch of launch vehicles from New Zealand by any person, or from outside New Zealand by New Zealand nationals.

A launch vehicle is defined as:⁷

- (a) a vehicle, the whole or any part of which—*
 - (i) reaches, or is intended to reach, outer space; or*
 - (ii) carries or supports the launch of, or is intended to carry or support the launch of, a payload; or*
 - (b) any component part of a vehicle described in paragraph (a).*

A launch is defined as ‘causing to take off or depart’ or ‘releasing’ and includes an attempted launch.

Launch from New Zealand

A launch licence is required for the launch of a launch vehicle from a launch facility in New Zealand, or from a vehicle in the air where that vehicle was launched from New Zealand.⁸

In applying for a launch licence an applicant must provide:⁹

- a* details of each proposed launch including each launch vehicle, launch facility and the purpose of the proposed launches;
- b* the protective security arrangements in place in relation to the launch vehicle telemetry and control and other launch systems and sensitive space technology;
- c* evidence of the applicant’s technical capability to conduct a safe launch;
- d* a safety case for the proposed activities under the licence;
- e* an orbital debris mitigation plan;
- f* evidence of the applicant’s fitness to hold a launch licence; and
- g* other information such as details of any current or pending spectrum authorisations.

6 Outer Space Act, s 51.

7 Outer Space Act, s 4.

8 Outer Space Act, s 7.

9 Licensing Regulations, sch 3.

A launch licence may only be granted if the Minister is satisfied that the applicant meets certain requirements relating to:¹⁰

- a* technical capability to carry out a safe launch;
- b* reasonable management of public safety risks;
- c* adequacy of an orbital debris mitigation plan; and
- d* consistency with New Zealand's international obligations.

The Minister retains residual discretion to refuse to grant a launch licence if he or she is not satisfied that a proposed launch is in the national interest or if he or she has concerns about the applicant's fitness to hold a launch licence.¹¹

Once issued with a licence, a licensee must comply with ongoing conditions and requirements, including but not limited to:¹²

- a* providing information on each proposed launch, such as the date, location, intended trajectory and basic orbital parameters;
- b* notifying the Minister of any change in the status of an overseas licence, where the New Zealand launch licence is based on this overseas licence;
- c* notifying the Minister if any part of a launch vehicle that reaches outer space is no longer in Earth orbit;
- d* having, or being satisfied that a person has, all necessary payload permits, facility licences or other authorisations for the proposed launch;
- e* conducting the launch and operations in a manner that minimises the risk of contamination of outer space or adverse changes to the Earth's environment, takes into account the activities of others in the use of outer space, is consistent with New Zealand's international obligations, and complies with New Zealand law; and
- f* complying with any other relevant conditions imposed by the Minister, including conditions imposed to avoid harmful interference with the space activities of others.

A launch licence must also contain conditions specifying the type and amount of insurance that the licensee must hold.¹³

The Minister may require a licensee, as a condition of the licence, to indemnify the Crown against any claim brought against the Crown under the Liability Convention or the Outer Space Treaty, or any other claim brought against the Crown under international law in relation to an act or omission of the licensee.¹⁴

A launch licence may be issued for up to five years and may be renewed for further periods of up to five years.¹⁵

The Minister may vary, revoke or suspend a licence at any time if he or she believes:¹⁶

- a* that the licensee has breached the Outer Space Act, any regulations or a condition of the licence;

10 Outer Space Act, s 9.

11 Outer Space Act, s 9.

12 Outer Space Act, s 10(1).

13 Outer Space Act, s 10(2).

14 Outer Space Act, s 10(3).

15 Outer Space Act, ss 11 and 12.

16 Outer Space Act, s 14.

- b* that the revocation, variation or suspension of the licence is required for national security, public safety or international law compliance reasons; or
- c* that any change in the status of an overseas licence, where the New Zealand launch licence is based on this overseas licence, affects New Zealand's national security, public safety or international compliance interests.

The obligations of a licensee under a launch licence survive the expiry or revocation of the launch licence and continue until all matters connected to the launch or launches under the launch licence have been completed.¹⁷

Launch from outside New Zealand by a New Zealand national

A New Zealand national (being a New Zealand citizen, permanent resident or body corporate) wishing to launch a launch vehicle from a launch facility outside New Zealand, or from a vehicle in the air that was launched from outside New Zealand, must obtain an overseas launch licence. The same process, requirements and conditions for a standard launch licence apply to an overseas launch licence.¹⁸

Payload permits

Launch from New Zealand

In addition to a launch licence, a person wishing to launch a payload from a launch facility in New Zealand, or from a vehicle in the air that was launched from New Zealand, must obtain a payload permit.¹⁹

Payload is defined as an object that is carried or placed, or is intended to be carried or placed, in outer space, including components of a launch vehicle that are specifically designed or adapted for the object, and including a load to be carried for testing purposes or otherwise on a non-profit basis.²⁰

Importantly, the Outer Space Act does not prohibit a person from entering into a contract for the launch of a payload or taking any other preparatory step without first obtaining a payload permit, provided he or she holds a permit at the time of the launch.²¹

As with a launch licence, an applicant must provide information about the proposed payload, associated ground stations and launch facilities, safety and security arrangements and an orbital debris mitigation plan to prove that he or she can manage public safety risks, has an adequate orbital debris mitigation plan and will not operate in a manner inconsistent with New Zealand's international obligations.²²

The Minister may refuse to issue a payload permit on the basis that the proposed operation of the payload is not in the national interest.²³

A permit holder must comply with specified conditions, including the condition to conduct the operations of each payload in a manner that (1) minimises the risk of contamination of outer space or adverse changes in the Earth's environment, (2) takes into

17 Outer Space Act, s 13.

18 Outer Space Act, ss 23 to 30; Licensing Regulations, sch 3.

19 Outer Space Act, s 15.

20 Outer Space Act, s 4.

21 Outer Space Act, s 15(4).

22 Outer Space Act, s 17; Licensing Regulations, sch 4.

23 Outer Space Act, s 17(2).

account the activities of others in the use of outer space, (3) is consistent with New Zealand's international obligations and (4) avoids harmful interference with outer space and terrestrial radiocommunications.

A licensee must also comply with any other relevant conditions imposed by the Minister, including conditions imposed to avoid harmful interference with the space activities of others.

The Minister may require an indemnity from the applicant as a condition of the permit and may also require a specified type and amount of insurance (although a condition about insurance is not mandatory).²⁴

There is no statutory expiration date for a payload permit and a permit may specify expiry on any date, or on the occurrence of a particular event.²⁵ A payload permit may be varied, revoked or suspended in the same manner and for the same reasons as a launch licence.²⁶

As with a launch licence, the obligations of a permit holder under a payload permit survive the expiry or revocation of the permit.²⁷

Launch from outside New Zealand by a New Zealand national

A New Zealand national wishing to launch a payload from a launch facility outside New Zealand, or from a vehicle in the air that was launched from outside New Zealand, must obtain an overseas payload permit. The same process, requirements and conditions for a standard payload permit apply to an overseas payload permit.²⁸

Facility licences

A person must not operate a fixed or mobile launch facility in New Zealand unless he or she holds a facility licence.²⁹

An applicant must provide information about the launch facility, evidence of technical capability to operate the facility, a safety case and evidence of fitness to hold a licence.³⁰ The application must then meet the usual requirements as to technical capability, safety and international law compliance. A facility licence may be refused on the grounds of national interest or the applicant's unfitness to hold a licence.³¹

As with launch licences and payload permits, a licensee must comply with any conditions prescribed or imposed by the Minister, although these conditions are not detailed in the Outer Space Act. The Minister may also require the licensee to indemnify the Crown as a condition of the licence.³² There are no requirements in the Outer Space Act regarding insurance for launch facilities.

A facility licence may be issued for up to five years and may be renewed, varied, revoked or suspended by the Minister.³³

24 Outer Space Act, s 18.

25 Outer Space Act, s 19.

26 Outer Space Act, s 21.

27 Outer Space Act, s 20.

28 Outer Space Act, ss 31 to 37; Licensing Regulations, sch 4.

29 Outer Space Act, s.

30 Licensing Regulations, sch 5.

31 Outer Space Act, s 40.

32 Outer Space Act, s.

33 Outer Space Act, ss 42 to 44.

High-altitude licences

A unique feature of New Zealand's space legislation is the high-altitude licence regime. A high-altitude licence is required to launch a HAV from New Zealand or from a vehicle in the air that was launched from New Zealand.³⁴

A HAV is defined as an aircraft or any other vehicle that travels, is intended to travel or is capable of travelling to high altitude, which means an altitude above the higher of flight level 600 and the highest upper limit of controlled airspace under the Civil Aviation Act 1990.³⁵

A high-altitude licence is not required for an activity already covered by a launch licence.³⁶ Certain HAVs are also exempt from the licensing requirements under the HAV Regulations.³⁷

An applicant must provide information about each proposed launch, any payloads proposed to be carried by the HAV and evidence of the applicant's fitness to hold a licence. In relation to an application for a HAV that is not an aircraft, the applicant must also provide evidence of its technical capability to conduct a safe launch and a safety case.³⁸

The Minister may grant a high-altitude licence if he or she is satisfied that the applicant is technically capable of conducting a safe launch of each HAV, can manage public safety risks and will operate in a manner consistent with New Zealand's international obligations.³⁹

In relation to each HAV that is an aircraft, the Minister must consult with the Director of Civil Aviation and receive confirmation that the HAV has the appropriate permits, certificates or documents.⁴⁰

A high-altitude licence may be refused on the basis of national interest, or the applicant's unfitness to hold a licence.⁴¹

A licensee must comply with the conditions and requirements set out in Section 48 of the Outer Space Act. The Minister may require a specified type and amount of insurance as a condition of the licence. However, there is no indemnification requirement for high-altitude licences.

The Outer Space Act does not provide for the expiry of high-altitude licences and merely empowers the Minister to revoke, vary or suspend a licence.⁴²

Offences

In addition to the licensing regime, the Outer Space Act creates offences for operating without the relevant licence or permit.⁴³

34 Outer Space Act, s 45.

35 Outer Space Act, s 4.

36 Outer Space Act, s 45(2).

37 These Regulations exempt balloons and model rockets, provided they meet certain specifications, from the HAV definition in the Outer Space Act.

38 Licensing Regulations, sch 6.

39 Outer Space Act, s 47(1)(a).

40 Outer Space Act, s 47(1)(b).

41 Outer Space Act, s 47(2).

42 Outer Space Act, s 49.

43 Outer Space Act, ss 65 to 70.

For each offence, the maximum penalty is as follows: for an individual, one year's imprisonment or a fine not exceeding NZ\$50,000, or both; and for a company, a fine not exceeding NZ\$250,000.

The Outer Space Act also creates various offences for providing false or misleading information to an enforcement officer, entering or failing to leave a segregated debris protection area or failing to display an identity card.⁴⁴

The offence that carries the most severe penalty is intentional interference with a launch vehicle or payload.⁴⁵ If a person intentionally, or without lawful excuse, takes, removes, uses or interferes with a launch vehicle, payload, related equipment (including debris from any of these) or technical data, with the intention of using or disposing of it for an industrial or commercial purpose, then the following penalties may apply: for an individual, up to five years' imprisonment or a fine not exceeding NZ\$100,000, or both; and for a company, a fine not exceeding NZ\$500,000.

Interference with a launch vehicle or payload without the requisite intention carries the comparatively smaller penalties of a NZ\$1,000 fine for an individual and a NZ\$10,000 fine for a company.

ii Radiocommunications

Depending on the nature of the proposed space activities, a person may also need to obtain a satellite filing and a radio or spectrum licence in addition to the licences under the Outer Space Act.

While the need for these is explained in more detail below, the satellite filing is intended to ensure co-ordination and avoid issues with other administrations, while the radio and spectrum licences are intended to ensure no interference within New Zealand.

ITU filing

The MBIE is the national administration responsible for submitting satellite filings to the ITU. An individual or company wishing to operate a satellite network using New Zealand orbital slots or spectrum must apply to the MBIE for the submission of a filing on its behalf.⁴⁶ The MBIE can accept filing applications at its discretion.⁴⁷

An applicant is responsible for providing the required information and for ensuring the content of the proposed filing complies with the ITU Radio Regulations and New Zealand's allocations for space services. If additional licences or permits are required to launch and operate space objects, the applicant is responsible for obtaining these.

Upon acceptance of an application for an ITU filing, the MBIE will enter into a deed of agreement with the applicant, under which the applicant will be held to 'performance milestones' to retain the satellite network filings.⁴⁸

44 Outer Space Act, ss 71, 73 to 75 and 77 to 78.

45 Outer Space Act, s 72.

46 Ministry of Business, Innovation and Employment Operational Satellite Policy (PIB 60).

47 Note that, anecdotally, the possibility of changes in government may be treated by the MBIE as a relevant factor when considering the acceptable duration and terms of a potential filing.

48 Ministry of Business, Innovation and Employment Operational Satellite Policy (PIB 60).

Radio and spectrum licences

Use of radio frequencies in New Zealand requires either a spectrum or radio licence in accordance with the Radiocommunications Act 1989 and the Radiocommunications Regulations 2001. The radio spectrum licensing regime is managed by the MBIE agency Radio Spectrum Management, which operates separately to the New Zealand Space Agency.

Licences are not required for satellite downlink as this is not regulated in New Zealand and is not eligible for protection from interference caused by other radiocommunication activities.⁴⁹

Whether a spectrum or radio licence is required will depend on the applicable regime and the rights holder. Radio spectrum rights are allocated under:

- a* the administrative regime, under which the MBIE grants radio licences for the use of the radio spectrum; and
- b* the management rights regime, under which private individuals or corporations are assigned management of certain bands of the spectrum (typically through a spectrum auction process), and issue spectrum licences to users of those bands.

Administrative regime – radio licences

As a matter of policy, the MBIE will only grant radio licences in accordance with New Zealand's frequency allocations.⁵⁰

A radio licence may be issued either to an applicant personally or by the MBIE as a General User Radio Licence (GURL). If a GURL has been granted in respect of a particular band of spectrum, any person may use the spectrum without needing to obtain a licence in his or her own name or pay licence fees, subject to the conditions of the GURL.

If there is no applicable GURL, a person must apply for a radio licence from the MBIE. A radio licence application must comply with technical compatibility requirements, equipment standards, non-interference requirements and New Zealand's international obligations.⁵¹

The duration of a radio licence will be at the discretion of the MBIE and the licence holder must pay an annual fee to renew the licence.

Management rights regime – spectrum licences

For radio spectrum subject to the management rights regime (i.e., frequencies held by private management rights holders), an entity must obtain a spectrum licence from the relevant rights holder.

Like the MBIE, a management rights holder may also issue a General User Spectrum Licence over any frequencies within their rights.

To obtain a spectrum licence from a management rights holder, an applicant must request a licence directly from the rights holder. A rights holder has the sole discretion to grant spectrum licences and is under no obligation to do so.

49 Ministry of Business, Innovation and Employment Operational Satellite Policy (PIB 60) at [3.1], [4.1.1].

50 Ministry of Business, Innovation and Employment Table of Radio Spectrum Usage in New Zealand (PIB 21).

51 Ministry of Business, Innovation and Employment Radio Licence Certification Rules (PIB 38).

A spectrum licence must be accepted by the Registrar of Radio Frequencies to be effective, which means it must be within specified emission limits. A licence application must also meet any conditions imposed on the management right, as well as any further conditions imposed by the rights holder.

A rights holder may set any price for a spectrum licence, and the licence holder is also responsible for paying annual licence fees to the MBIE.

A fixed term can be set for a spectrum licence and the expiry date must not be later than the expiry date of the record of management rights to which the licence relates.

III DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

i Approach to regulation

The government has taken an openly pro-industry approach in the establishment of its space law framework.

A concern raised in the drafting process for the Outer Space Act was that ‘overly onerous licensing requirements would impose high compliance costs and would deter foreign payload providers from launching in New Zealand’.⁵² The Outer Space Act is accordingly drafted to ‘avoid unnecessary prescription’ and allow decision makers to ‘tailor the conditions of licences and permits . . . rather than a “one-size fits all” approach’.⁵³

There is, of course, a risk that this lack of prescriptiveness could lead to the MBIE, operating through the New Zealand Space Agency, taking a more conservative approach in the future, should that agency consider it necessary to minimise the risk to the government of proposed activities.

Overall, the government has made it clear that there is a need to balance commercial opportunity with national security interests and international law compliance. The Outer Space Act accordingly strikes a balance between all three, although it upholds the principle that ‘it is essential the legal framework does not inhibit the development of a space launch industry’.⁵⁴

ii HAVs

New Zealand is the first and only country in the world to have a dedicated regulatory regime for HAVs.

In its regulatory impact statement for the Outer Space Bill, the MBIE noted that newly developed technologies were operating in near space and performing similar functions and services to satellites. It proposed that these technologies be ‘brought within the scope of the space regime’ to ensure consistency of treatment, and to ensure New Zealand remained compliant with its international obligations.

52 Ministry of Business, Innovation and Employment Regulatory Impact Statement: The Outer Space and High-altitude Activities Act 2017 (14 August 2017).

53 Ministry of Business, Innovation and Employment Regulatory Impact Statement: The Outer Space and High-altitude Activities Act 2017 (14 August 2017).

54 Ministry of Business, Innovation and Employment Regulatory Impact Statement: Outer Space and High Altitude Activities Bill (June 2016).

The MBIE considered that the existing Civil Aviation Act did not sufficiently meet New Zealand's international obligations as it only dealt with specified aviation safety and had no powers to control activities or operations that may pose a threat to national security or are not in the national interest.⁵⁵

It was therefore suggested that the Outer Space Act contain powers to regulate and permit aircraft activities (in particular those of balloons and drones) in near space on the same basis as similar activities carried out by satellites in outer space.

IV CURRENT DEVELOPMENTS

New Zealand's entire space law regime is a new development. At this stage, the commercial space launch industry is confined to Rocket Lab, and there is no evidence that the government is exploring its own space-related endeavours.

V OUTLOOK AND CONCLUSIONS

As discussed in Section I, the government is eager to engage with the space launch industry and passed the Outer Space Act with a view to future, as well as current, opportunities. It is likely that it will be receptive to approaches from operators both in and outside New Zealand.

However, New Zealand's space legislation is still largely untested and, aside from the Rocket Lab arrangement, there is little precedent for the application, interpretation and enforcement of the Outer Space Act, and the Licensing Regulations and the HAV Regulations.

55 Ministry of Business, Innovation and Employment Regulatory Impact Statement: Outer Space and High Altitude Activities Bill (June 2016).

PORTUGAL

Magda Cocco, Helena Correia Mendonça and Cristina Melo Miranda¹

I INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

Portugal has been taking important steps in the space sector in recent years. In addition to the approval of its space strategy in 2018 (Portugal Space 2030), Portugal also became part of the European Space Surveillance and Tracking programme (EUSST); launched the Atlantic International Research Centre (the AIR Centre); launched the Azores International Satellite Launch Programme; and approved its own National Space Act and Regional Space Act. Moreover, it reinforced its contribution to the European Space Agency (ESA), appointed a national space authority (the Space Authority) and set up a space agency (Portugal Space).

i Portugal Space 2030

Resolution of the Council of Ministers No. 30/2018 of 12 March 2018 approved Portugal Space 2030. Its strategic goals include:

- a* promoting economic growth and the creation of skilled employment through space-related markets;
- b* promoting the generation of satellite data through new space technologies and infrastructures;
- c* contributing to the development of Portugal and scientific international cooperation, taking into consideration the geostrategic positioning of Portugal; and
- d* guaranteeing the development and evolution of legal, financial, institutional, and cultural and educational frameworks aimed at developing the space sector in Portugal.

The strategy contains three axes. The first relates to the exploration of space data and signals through space services and applications, or as enabled by space technologies. In this respect, the strategy refers to the need to bring the space sector and other sectors together, and to find the means of exploring multiple data sources (big data). The integration of communication networks (including 5G), energy networks and mobility infrastructures, and the development of autonomous cars, drones, smart agriculture and the internet of things, are referred to as elements that will promote space technologies and services. The second axis relates to the development, construction and operation of space equipment, systems, infrastructures and services for space data generation, with an emphasis on mini-, micro- and nanosatellites. As part of the second axis, the development of a programme for access to space is mentioned,

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which has the following goals, among others: decreasing the costs of access to space through innovative launching technologies, which are also environmentally sound and promote the growth of small satellites; developing the next generation of satellites; and implementing constellations of satellites in areas such as Earth observation, satellite navigation and satcom. This axis also makes reference to Portugal's participation in the EUSST. The third axis focuses on the development of national capability and skills in the space sector through scientific research, innovation, education and scientific culture. In this area, reference is made to increasing Portugal's participation in ESA and EU programmes, as well as reinforcing the cooperation of the Portuguese scientific community with international partners and industry.

To achieve the aforementioned three axes, the strategy sets out a framework of five courses of action: (1) legal; (2) financial; (3) institutional; (4) internationalisation; and (5) scientific culture. The first aims to create a competitive space law. The second addresses the investment strategy for the sector. The third indicates that the institutional framework will cover a regulatory entity for licensing space activities, and a promoting agent – Portugal Space. The fourth covers the AIR Centre initiative, and also makes reference to cooperation and international partnerships with other countries. Finally, the fifth aims to develop education and scientific culture in the space sector, as well as facilitating access to information about space by the public. The development of a specialised consortium in the space sector in the form of a collaborative laboratory and continuing to promote the incubation of new companies in close cooperation with ESA (e.g., through the ESA Business Incubation Centre (ESA-BIC) in Portugal) are also referred to.

The core institutional framework for space in Portugal comprises the Space Authority, which is tasked with supervising and licensing space activities, and Portugal Space. The Space Authority is, provisionally, the National Communications Authority.

ii Portugal Space

Portugal Space was set up in March 2019 under Resolution of the Council of Ministers No. 55/2019. It is a private non-profit association comprised only of members from the public sector. Initial members are the Foundation for Science and Technology; the National Agency for Innovation; the General Directorate for National Defence Resources, designated by the Ministry of Defence; and the government of the Azores, designated by the Autonomous Region of the Azores. Portugal Space may integrate other public entities whose activity is related to its purposes. It is the entity responsible for executing Portugal Space 2030 and is tasked with developing the national space sector. All national programmes relating to space are integrated within the agency, and they shall be executed in close connection with the national SST programme. In addition, Portugal Space is tasked with providing technical assistance for the implementation of the Azores spaceport. It also serves as an ESA Hub.

The participation of Portugal in the EUSST is addressed in Resolution of the Council of Ministers No. 116/2017 of 24 August 2017, which created, under the Ministry of Defence, a temporary body called the Space Surveillance and Tracking Project Group (GPSST). The GPSST was tasked with preparing and implementing national space surveillance and tracking (SST) capabilities, as well as preparing the national application for the EUSST (under Decision No. 541/2014/EU of 16 April 2014 establishing a Framework for Space Surveillance and Tracking Support). The Commission Implementing Decision of 12 April 2014 established the procedure for participation of Member States in the EUSST and the Commission Implementing Decision of 19 December 2016 established a coordination plan for the SST framework and for the procedure for the participation of

Member States. The GPSST was further tasked with approving the general terms of the governance model for the national SST programme and was indicated as the designated national entity in the EUSST consortium. The Portuguese application to the EUSST was approved in mid 2018 by the European Commission. The GPSST was originally set up for one year, but Resolution of the Council of Ministers No. 113/2018 of 31 August 2018 extended its mandate until 31 December 2018. This Resolution further clarified that the General-Directorate for National Defence Resources would be responsible for managing the national SST programme (and be the designated national entity in the EUSST) after expiry of the GPSST and up until the new governance model was defined. The process for acquisition, installation, operation and exploitation of the national SST system was launched under a public tender² published in the Official Journal on 5 April 2019.

iii AIR Centre

The AIR Centre is an intergovernmental initiative that aims to explore the Atlantic region (the Atlantic) in a sustainable way. In July 2017, the AIR Centre White Paper 'Atlantic Interactions' established an integrative approach to outer space, climate energy and ocean science in the Atlantic, together with emerging methods of data science management. With regard to outer space, the White Paper stresses the importance of space systems and applications. Among other things, it highlights:

- a* the use of mega constellations and small satellites to closely study and monitor the ocean and the atmosphere;
- b* the importance of fostering affordable access to space, especially with regard to the launch of small satellites to collect information on the Atlantic;
- c* the use of space data to improve safety in the Atlantic; and
- d* the use of the Atlantic islands for the implementation of ground facilities for SST.

Following the issuance of the White Paper, several Declarations have been signed under High-Level Industry-Science-Government Dialogues, which have been held in several countries. Under the Florionópolis Declaration, which was signed in November 2017, it was agreed that the AIR Centre should be established as an intergovernmental organisation with headquarters in the Azores and with a network of centres on the Atlantic islands, together with mainland research centres in India, Nigeria, Angola and South Africa, and in Europe and the Americas. By 2020, it is expected that full institutional autonomy, with an appropriate institutional, legal and financial structure, together with full scientific autonomy, will be achieved. In the meantime, a non-profit association to promote the AIR Centre (the Association for the Development of the AIR Centre) was registered in Portugal, to develop initial activities and promote Atlantic Interactions. Resolution of the Council of Ministers No. 29/2018 of 12 March 2018 addresses the AIR Centre, including tasking the Ministry of Science, Technology and Higher Education, through the Foundation for Science and Technology, to launch initiatives and support national programmes related to the Atlantic. The AIR Centre has eight founding members covering three continents (Portugal, Brazil, Spain, Angola, Cape Verde, Nigeria, Uruguay and São Tomé e Príncipe), with Portugal, Spain,

2 Public Tender No. 029/DGRDN/2019 – Procedure Announcement No. 3545/2019.

Brazil and South Africa currently leading the implementation through their participation in the Centre's Executive Committee. The United Kingdom, Argentina and India are observers. Several research and technology organisations are also part of the initiative.

iv Azores International Satellite Launch Programme

The Azores International Satellite Launch Programme (ISLP) is the national initiative for the establishment of a spaceport in the Azores. The ISLP aims to install an open spaceport whereby more than one type of launcher may be launched from the port. The purpose is to guarantee low-cost, frequent and regular access to space for small satellites. Under the ISLP, companies were called upon to submit expressions of interest (with a deadline of 31 October 2018) and a total of 14 were submitted. In accordance with information provided by the Ministry of Science, Technology and Higher Education, interested companies included ArianeGroup, Virgin Orbit, Roscosmos, Sierra Nevada, Rocket Factory Augsburg, Elecnor Deimos, Avio and PLD Space. In total, the expressions of interest included 11 companies from the European Union, two from the United States and one from Russia. The purpose of this international call for interest was to encourage and invite enterprises and public organisations from around the world to collaborate with Portuguese enterprises and research laboratories to design, install and operate a spaceport in the Azores. The process for setting up the spaceport is under way and a formal open tender was launched in March 2019.³ The tender documents state that space activities from the spaceport are to start in 2021. In accordance with the latest news published at the time of writing, three consortia were qualified for submission of their proposed solutions for the spaceport.

v Legal framework

The National Space Act was approved by Decree-Law No. 16/2019 of 22 January 2019. The Act sets out a number of provisions and measures aimed at facilitating and encouraging space private activity in Portugal. The Azores has also enacted the Azores Regional Space Act (approved by Regional Legislative Decree No. 9/2019/A), which regulates space activities taking place in the Azores and establishes the economic and financial regime for these activities. In addition, the Space Authority also issued the Regulation on Access and Exercise of Space Activities (Regulation No. 697/2019) (the Space Authority Regulation), which sets up the procedures for obtaining licences and pre-qualifications, as well as for registering space objects and transferring ownership of space objects.

vi International regimes

Portugal became a party to the UN Registration Convention⁴ in 2018 and to the Liability Convention in 2019.⁵ It had previously acceded to the Outer Space Treaty and the Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space. It is also a signatory to the Treaty Banning Nuclear Weapon Tests in the

3 The tender for construction, operation and exploitation of a spaceport enabling a new generation of launch services, located on the island of Santa Maria, Azores (Procedure Announcement No. 3074/2019 as published in the national Official Journal).

4 By means of Decree 24/2018 of 4 October. The Convention became binding for Portugal from 2 November 2018, in accordance with Notice No. 143/2018 of 28 November 2018.

5 By means of Decree 14/2019 of 16 April 2019.

Atmosphere, in Outer Space and under Water; the Convention Relating to the Distribution of Programme-Carrying Signals Transmitted by Satellite; and the Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations.

II REGULATION IN PRACTICE

i National Space Act

The National Space Act sets out the national framework for accessing and performing space activities, which include space operations and launch-site operations. Space operations comprise the following:

- a* Launch and return operations: the activity whereby space objects are intended to be sent or launched into space, notably to be placed in or beyond orbit, and then returned to the Earth's surface. The launch and return operator performs launch and return operations.
- b* Command and control operations: the activity consisting in exercising effective control over a space object. The command and control operator performs command and control operations of space objects in outer space, whether temporarily or in transit. Where the space object cannot be controlled or guided, the command and control operator will be deemed the natural or corporate person who hired the launch or exploits the space object, as notified to the Space Authority.

Launch-site operations relate to the management, administration or direction of a launch site, the definition of which includes facilities intended for the return of space objects. The launch site operator manages, administers and directs a launch site.

The National Space Act applies to space activities performed both in the national territory irrespective of the nationality of the operator and outside the national territory by Portuguese operators or operators established in the national territory.

Space activities are subject to (1) a mandatory licence for launch or return operations and for command and control operations and (2) registration of space objects. The National Space Act further created a voluntary pre-qualification system. Under this system, operators, systems, processes, and features and specifications can be certified in a set of elements, which may include the technical, economic and financial capacity of operators, the compliance of systems and processes with applicable laws and regulations, and the features and specifications of space objects. Pre-qualification aims at streamlining the licensing procedure by waiving the need to submit information set out in the pre-qualification certificate in the licensing procedure.

There are two types of licence: the individual licence, which is applicable to each type of space operation; and the blanket licence, which is applicable to a series of space operations of the same type. In addition, there are joint licences, which are those applicable to space operations of the same type or a different type that comprise one or more launch or return operations and the corresponding operations of command and control of space objects launched, even if performed by more than one operator. Under the joint licensing procedure, the same or different types of space operations may, even if carried out by more than one operator, be licensed to a single operator for itself and on behalf of other operators.

The licences are granted if the Space Authority is satisfied that a set of conditions have been met, including:

- a* the applicant has the technical, economic and financial capacity for the space operations it intends to carry out;
- b* the space operation duly safeguards against damage to the Earth's surface, airspace and outer space, in accordance with applicable national and international commitments;
- c* the space operation ensures the minimisation of space debris as much as possible, in accordance with international principles and commitments;
- d* the space operation is compatible with applicable public security provisions, including on public health and citizens' physical safety;
- e* the space operation does not jeopardise domestic security or the strategic interests of Portugal, nor does it breach Portugal's international commitments;
- f* all other authorisations and certificates required for the purpose of the space operation have been issued by the relevant entities; and
- g* the applicant carries mandatory civil liability insurance as required under the National Space Act.

In addition, the licence may stipulate other requirements, including in connection with environmental matters.

The decision to grant or withhold the licence must be issued by the Space Authority within 90 days of receipt of a complete application. The National Space Act also provides that a special licensing framework, which may consist of shorter deadlines or streamlined procedures, may be defined by the Space Authority for certain circumstances, such as: (1) if the applicant is a public entity or an international organisation acting under international agreements concluded with Portugal; or (2) if the intended space operation is performed exclusively for scientific, research and development (R&D), educational or training purposes, or consists of activities with experimental purposes with demonstrable low risk for the Earth's surface, airspace and outer space, including for public health and citizens' physical safety.

The National Space Act also addresses circumstances whereby a licence for space operations has been obtained in another country. First, and in general, the special licensing procedure referred to above can be established for cases where the applicant secured authorisation for the performance of the space activity from another state whose legal framework ensures compliance with applicable international commitments. Secondly, space operations performed abroad but subject to the National Space Act may be exempted from mandatory licensing if the operator is able to demonstrate to the Space Authority's satisfaction that it secured the proper authorisations and that it abides by the law of a state with which Portugal has an agreement in place to ensure compliance with its international commitments.

In relation to registration, the National Space Act establishes that space objects for which Portugal is the launching state are subject to registration with the Space Authority, in accordance with Portugal's international commitments. The elements to be registered broadly correspond to those of the UN Registration Convention. In addition, the National Space Act also provides that the following must be registered with the Space Authority:

- a* space objects whose launch, return or command and control are performed by operators licensed in Portugal;
- b* the transfer of ownership of any space objects whose launch, return or command and control is carried out by operators licensed under the National Space Act;

- c* the end of the useful life of a space object operated and controlled by a command and control operator licensed in Portugal; and
- d* any incident or serious accident suffered by the space object.

As regards liability, the National Space Act indicates that operators are liable for damage caused in the performance of the space activity, as follows: (1) strict liability for damage caused by the space object to the surface of the Earth or to aircraft in flight; and (2) liability in the event of fault for damage falling outside the scope of point (1). There is also a mechanism of redress by means of which, if Portugal is held liable, pursuant to its international commitments, for any damage caused by a space object, the state has a right of recourse against the operator that, under the National Space Act, is responsible for that space object. The right of redress will be capped at the amounts to be defined by an order of the members of government responsible for finance, and science and technology. However, the cap will not apply in certain circumstances, including in the event of liability for damage due to wilful misconduct or gross negligence, or if the operator fails to comply with its licensing obligations.

Licensed operators are also under the obligation to take out civil liability insurance, with minimum capital to be defined by an order of the members of government responsible for finance, science and technology and the sea, which may also regulate other minimum requirements for the insurance agreement. By means of this order, the insurance obligation may also be waived or the insured amount reduced in the following circumstances:

- a* operations of launch, return, and command and control of space objects of small dimensions, as defined by the Space Authority;
- b* space operations conducted exclusively for scientific, R&D or educational and training purposes;
- c* if the operator submits another financial guarantee as permitted under the order and this is accepted by the Space Authority; and
- d* operations that demonstrably entail reduced risks, as defined by the Space Authority.

The National Space Act contains a set of provisions for incident and accident reporting, which also include the obligation to notify any manoeuvre, malfunction or anomaly of the space object, or other circumstances arising from or in connection with the space activity, that may result in an incident or serious accident. Operators are also subject to obligations relating to the Space Authority's supervision and inspection powers, including the following: allowing and facilitating free access to the facilities and their annexes, as well as to their devices and instruments; providing all the information and assistance required for the performance of the supervision and inspection; and maintaining in their facilities in Portugal a duly organised and updated file containing all relevant documents and records relating to the space activities they perform and to the licensing and pre-qualification procedures.

In addition to its powers relating to licensing, registration, pre-qualification, supervision and inspection, the Space Authority is tasked with assessing and deciding on requests or claims by the operators and resolving disputes in connection with the obligations arising from the National Space Act, between entities subject to these obligations, and without prejudice to the possibility of resorting to courts. The Space Authority is also tasked with initiating and dealing with administrative offence proceedings and applying the penalties. In this respect, infringements of the Act are administrative offences that may lead to the application of penalties of between €250 and €44,891.81, depending on whether the operator is a

natural or corporate person and the gravity of the offence. There are also ancillary penalties, consisting of the prohibition to perform space activities for a certain period of time and the suspension of licences.

Three additional points are worth mentioning. First, the National Space Act contains provisions on the transfer of a licence and on the transfer of ownership of space objects. The first is subject to authorisation by the Space Authority (which shall only be approved if all legal requirements for its issue are met), and the second is subject to notification to the Space Authority.

Secondly, there are regulations and orders that complement the National Space Act. These include (1) the regulation by the Space Authority for licensing, registration, pre-qualification and transfer of ownership of space objects, and (2) orders on liability (for caps) and insurance (minimum capital and other minimum requirements, waiver and reduction of insured amounts as permitted by the Act).

The Space Authority Regulation was approved in July 2019. The Regulation aims to create simple and effective procedures with a view to promoting private activity. However, some points may create challenges, such as the following:

- a* The Regulation does not create a special licensing procedure for the cases foreseen in the National Space Act, but instead establishes that it is the applicant that must require a simplified procedure and the Space Authority, within 10 days, must communicate the ad hoc specific procedures to be followed. This could create uncertainty for the industry regarding the licensing requirements and the process to be taken.
- b* The Regulation does not seem to be fully aligned with the National Space Act regarding who can obtain a launch licence (as it seems to limit this licence to the launch operator, while the National Space Act extends it to whoever intends to launch a space object, thus also covering payloads). This may raise doubts as to the types of licences operators must obtain.
- c* The Regulation seems to limit the possibilities of joint licences for different types of operations, thus preventing these licences being used for operations of the same type performed by different operators – an option expressly envisaged by the National Space Act.
- d* The Regulation requires a level of information from the applicant that may be too burdensome, especially detailed information relating to the spaceport from which a space object will be launched.

The National Space Act also addresses the economic and financial regime applicable to space activities by indicating that it shall promote the economic and financial sustainability of the activities carried out by the Space Authority, notably by means of the collection of fees and levies from the companies and other entities subject to its supervisory powers.

Lastly, the National Space Act establishes that the procedures for the license, pre-qualification, registration and transfer of space objects in connection with activities to be developed in the autonomous regions of the Azores and Madeira, and the corresponding economic and financial framework, are to be established by means of a regional legislative decree.

ii Azores Regional Space Act

As mentioned in Section I.v, the Azores Regional Space Act was enacted in 2019 and contains the legal framework for licensing, pre-qualification, registration and transfer of space objects relating to activities developed in the Azores (defined as those activities based on both offshore and onshore infrastructures or platforms, including, in this instance, the maritime areas adjoining the archipelago). The Azores Regional Space Act duplicates the provisions of the National Space Act, with some new features, notably the following:

- a* it creates a regional space authority (EER) responsible for the licensing, pre-qualification, registration and transfer of space objects, and the supervision of space activities in the Azores;
- b* it indicates that the procedures for licensing, pre-qualification, registration and transfer of space objects are subject to the prior technical review of the Space Authority;
- c* it indicates that the EER must communicate to the Space Authority all required information so that the Space Authority can comply with the applicable international obligations (especially those relating to registration of space objects);
- d* it clarifies that the EER and the Space Authority shall cooperate in the above procedures, as well as in the supervision of space activities; and
- e* it introduces a fee for the use of space, the legal framework of which is unclear and has no parallel in other jurisdictions.

By replicating the conditions of the National Space Act and creating the EER, the Azores Regional Space Act may lead to the duplication of processes that private operators will have to comply with for pursuing space activities in the Azores. For instance, it seems that operators will have to obtain two licences: one from the Space Authority and one from the EER. In addition, it seems that the breach of either Act will lead to fines, meaning that operators may be subject to fines twice. It is hoped that the coordination between the Space Authority and the EER, as expressly addressed in the Azores Regional Space Act, will be sufficient to overcome these limitations.

In addition, the Azores Regional Space Act indicates that regional regulations will be approved for the procedures to license, pre-qualify, register and transfer space objects. This Act also indicates that a regional order will be approved with relation to insurance, which may lead to incompatibilities or duplicated obligations given that a national order on insurance under the National Space Act is also envisaged.

Despite duplicating most of the provisions of the National Space Act, some wordings of the Azores Regional Space Act are placed in a different section or seem to be more similar to prior versions of the National Space Act, which may indicate that the Azores Regional Space Act was based on an old version of the National Space Bill. This situation further complicates the coordination and interpretation of the Azores Regional Space Act in relation to the National Space Act.

From a strictly legal perspective, the National Space Act only indicates that the procedures for the licensing of space activities, and the pre-qualification, registration and transfer of space objects, in connection with activities to be developed in the autonomous regions of the Azores and Madeira, are to be defined by a regional legislative decree. However, the Azores Regional Space Act appears, in practice, to duplicate the national regime.

III DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

The Portuguese space framework contains a set of distinctive features resulting from the National Space Act and the approach taken with regard to the future spaceport of the Azores.

The National Space Act does not cover the operation of spaceports except for the purposes of pre-qualification (and supervision). This means that the licensing regime applies only to the launch, operation and return of space objects, and not to terrestrial activities consisting of building and operating a spaceport. Hence, instead of a licensing regime whereby any stakeholder could install a spaceport in the country provided certain requirements are met, the approach has been to select a general location (the island of Santa Maria in the Azores) and open that location to a public tender for the selection of an operator.

Another distinctive characteristic is that the National Space Act indicates that the procedures for licensing, pre-qualification, register and transfer of space objects relating to activities taking place in the Azores and Madeira are defined by regional acts. This is especially important for operators that intend to carry out space operations in the future Azores spaceport because the Azores has already enacted the Azores Regional Space Act.

It is clear that there are several points in the Regional Space Act that must be harmonised with the National Space Act. In turn, certain procedures in both Acts must be harmonised with the procedure for the spaceport, to avoid differing, incompatible or burdensome obligations for operators. The exact details of how this coordination will be achieved are yet to be determined, as they depend upon the approval of the regional regulations by the Azores and the practical approach that the Space Authority and the regional space entity will take in their relationship.

The National Space Act contains a number of innovative solutions aimed at encouraging private activity in Portugal, which are outlined below.

- a* In addition to an individual licence for each space operation, an operator can obtain a blanket licence covering a set of operations, which will facilitate the launching of constellations of satellites. A joint licence for several space operations, even if performed by different operators, can also be obtained, which will simplify the licensing of related space operations.
- b* A simplified licensing procedure may be implemented in certain situations, as indicated above, such as for operations that are carried out exclusively for scientific, R&D, educational or training purposes, or for experimental operations with low risk.
- c* In the event of space operations carried out by Portuguese nationals abroad, the requirement for a licence can be waived provided certain other requirements are met. In addition, if the operator obtained a licence abroad it may also obtain the Portuguese licence under a simplified licensing procedure.
- d* A pre-qualification regime has been created to expedite the licensing process, removing the need to resubmit the same information for future licences.
- e* A liability cap in favour of operators in cases where Portugal is internationally liable for space activities has also been established. At the time of writing, the amount of the cap is to be determined in a future order. It will be possible to establish different caps in accordance, for example, with the risk of the operation.
- f* There is mandatory civil liability insurance, but the insurance may be waived or the insured amount reduced in certain cases, such as for small satellites, space operations carried out exclusively for scientific, R&D, educational or training purposes, or

operations with low risk. Insurance may also be waived or reduced if the operator submits another financial guarantee as permitted by the future order (see above) and if accepted by the Space Authority.

- g Breach of the Act carries fines only, which cannot exceed €44,891.81. Ancillary sanctions prohibiting the carrying out of space activities or suspension of licences are established for certain cases.

The Space Authority is a one-stop shop, meaning that it may also assume responsibility for communicating with all other competent authorities whose authorisation may be required for a space operation, thus avoiding the need for operators to deal directly with the authorities.

To ensure that the solutions listed above are effective, careful coordination with the Azores Regional Space Act is required, as this Act duplicates the conditions for licensing, pre-qualification, registration and transfer of space objects and may, as a result, create unexpected burdens for operators. Clarification of the procedures established in the Space Authority Regulation and the harmonisation of these procedures with the National Space Act may also have to be evaluated to guarantee a clear, simple and predictable legal framework.

IV CURRENT DEVELOPMENTS

Portugal has been quite active in recent years when it comes to space activities, as indicated above. The National Space Act and the Azores Regional Space Act have been enacted and the process for installing a spaceport in the country is under way. The National Space Act was drafted with due attention to the need to respond to the advent of small satellites and constellations of satellites, and aims to create solutions that will facilitate these activities. The spaceport seems to be focused on the vertical launch of small satellites through a solution available to more than one type of launcher, but the Satellite Launch Programme also indicates that the use of air-based launching solutions may be considered, given that there are airport facilities that could be used. There is, in addition, concern regarding the environmental sustainability of the spaceport. However, at the time of writing, the complete framework is still under construction: in addition to regional regulations (as required by the Azores Regional Space Act), the orders on liability and insurance also need to be approved, and the fees for licences have not yet been determined.

The AIR Centre is also making progress and is expected to be formally incorporated by 2020. The process for acquiring the infrastructure for the national SST system, which will enable Portugal to participate in the EUSST, has also been launched, and Portugal Space has been set up.

ESA-BIC has led to the creation of at least 30 companies and 240 new jobs. Moreover, there is also an express reference in Portugal Space 2030 to the need to promote the suitability of structural funds and of public funding for development and capacity building in the space sector, as well as to the diversification of investment sources, including access to the European Investment Bank.

V OUTLOOK AND CONCLUSIONS

The National Space Act contains a set of innovative solutions for Portuguese and foreign operators in the country. Together with Portugal Space 2030 and the spaceport in the Azores, it is paving the way for increasing space activities and furthering the development of the

private sector and of R&D in Portugal. The increasing contributions to ESA, as well as the strengthening of international cooperation (including with the European Maritime Safety Agency and the European Global Navigation Satellite Systems Agency (the future EU Agency for the Space Programme)), as indicated in Portugal Space 2030, are also relevant incentives for encouraging space activities in Portugal.

The Portuguese market will thus greatly benefit from these investments and innovations. The current market – which Portugal Space 2030 indicates has had an economic return above 120 per cent in the past decade, involves a workforce of more than 1,400 people, including 300 highly qualified engineers, and generated a turnover of approximately €890 million between 2006 and 2015 – is thus expected to continue to grow. Several projects in this area are already under way, such as Project Infante, developed by a Portuguese consortium, which aims to deploy a constellation of small satellites for maritime surveillance, Earth observation and communications between satellites and ground stations. In parallel, public initiatives will continue to develop, such as the envisaged installation of a new tracking antenna in the Azores, the possibility of installing a Copernicus data centre in Portugal and deploying infrastructures for Galileo, Europe’s global satellite-based navigation system (as indicated in Portugal Space 2030).

The possibility of a framework for Earth observation data, space mining, human space flight or suborbital flights has not been discussed (with the National Space Act open to be interpreted in a manner whereby suborbital flights of space objects are included in the Act – although this view may require clarification from the Space Authority). However, the expected growth in space activities and the increased visibility the current initiatives will inevitably bring to the country may lead to greater awareness in these areas and contribute to the approval of relevant regimes. The work of both the Space Authority and Portugal Space will also play an important role in clarifying, detailing and encouraging initiatives and activities in the sector.

UNITED KINGDOM

Joanne Wheeler MBE and Vicky Jeong¹

I INTRODUCTION

The UK's original space programme commenced in 1952, with a mission launched 10 years later, making the UK the third nation in space. It remains a leader in space, particularly as a thought leader in regulation.

In 2010, the industry, government and academia collaborated to create the Space Innovation and Growth Strategy (IGS). As a result of the IGS, the UK Space Agency was created, a National Space Policy was published and several regulatory changes were implemented. A space cluster was also established in Harwell, south Oxfordshire, leading to the creation of the Satellite Applications Catapult and the European Space Agency's European Centre for Space Applications and Telecommunications.

The space sector remains a key growth area for industry, academia and the government, with the ambition to gain 10 per cent of the global space business by 2030.

One of the goals of the UK government is to ensure that it has a globally competitive and progressive regulatory regime.

II INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

The UK was one of the early pioneers to adopt national space legislation to regulate the space operational activities of non-governmental (private commercial) entities in 1986 following Norway, Sweden and the United States. The UK is also one of the founding Member States of the European Space Agency having ratified the Convention for the establishment of a European Space Agency² on 28 March 1978. The UK has ratified the four core United Nations (UN) space treaties.³ It has not, however, signed or ratified the Moon Agreement 1979.

i History of the UK government's space policy

In the early 1980s, the government instructed the Space Division of the Department of Trade and Industry to establish an ad hoc committee to assess how UK space activities should be

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2 Convention for the establishment of a European Space Agency (CSE/CS(73)19, rev. 7).

3 These are the Outer Space Act 1967, the Rescue Agreement 1968, the Liability Convention 1972 and the Registration Convention 1975.

organised and make recommendations.⁴ In 1985, this committee became the British National Space Centre (BNSC), which was the government agency responsible for coordinating space policy. The UK Space Agency (UKSA) was established on 1 April 2010 to replace the BNSC.

ii Outer Space Act 1986

The Outer Space Act 1986 (OSA) is the current basis for the regulation of activities carried out in outer space by organisations or individuals established in the UK or in its Crown dependencies or certain overseas territories.⁵

Licence applicants (applicants) from one of the UK's overseas territories to which the OSA has been extended⁶ will need to apply to their own Governor's office for an OSA licence. Applicants from one of the UK's overseas territories to which the OSA has not been extended are to approach the government of the overseas territory, which would then liaise with the Foreign Commonwealth Office and the UKSA over whether it would be appropriate to extend the OSA to that territory.

The OSA sets out the requirement for a space activity licence⁷ for:

- a* launching or procuring the launch of a space object;
- b* operating a space object; or
- c* carrying out any other activity in outer space.

It is an offence for a person to carry out a licensable activity without a valid licence.⁸

The OSA confers powers on the secretary of state to grant outer space launch and operations licences subject to such conditions as he or she considers fit.⁹ These powers are delegated to the UKSA, which is an executive agency that is sponsored by and reports to the Department for Business, Energy and Industrial Strategy (BEIS).

iii Space Industry Act 2018

The Space Industry Act 2018 (SIA) received royal assent in 2018 and is likely to come into force in 2020. The SIA will govern all activities carried out in or from the UK. The OSA will, however, still apply to launches or other activities carried out by UK nationals outside the UK.

III REGULATION IN PRACTICE

i OSA licence requirements

Licensing procedures

The OSA currently governs space activities carried out by UK nationals in the UK or elsewhere.

The licence requirements and procedures are currently set out at a high level in the OSA and in more detail in the Guidance for Licence Applicants issued by the UKSA (Guidance). The process is well established, and approximately 10 licences have been granted annually

4 Millard, D, 'An Overview of United Kingdom Space Activities 1957-1987', esa.int/esapub/hsr/HSR_36.pdf.

5 Section 2 of the OSA.

6 Cayman Islands, Gibraltar and Bermuda.

7 Section 1 of the OSA.

8 Section 12(1) of the OSA.

9 Section 4 of the OSA.

in recent years until a few years ago when the advent of large communications and Earth observation constellations have much increased this figure. The UKSA outsources certain parts of the overall assessment to the private sector (in particular the technical assessment and the insurance check). This approach is largely owing to the limited size of the UKSA and the frequency of licence applications.

Satellite manufacturers are not required to obtain a licence when delivering a satellite at a launch site but the in-orbit delivery of a satellite generally requires a licence.

Satellite operators are explicitly required to obtain a licence for the procurement of a launch (including the entity that is ultimately commissioning and paying for launch), even if the respective entity is not subsequently conducting the in-orbit operations of the space object.

Satellite operators are required to obtain a licence not because they own a satellite but because they have the operational control over a satellite. The emphasis is on the entity that has the ultimate authority over the in-orbit operation, from a decision-making standpoint irrespective of the location of the mission control centre or telemetry, tracking and control stations. The key criterion is the 'direct and effective' control over the satellite.

In relation to the territorial scope of an application, the main criterion is the domicile of an operator in the UK (the presence of a UK company is sufficient rather than UK headquarters).

Licence application administration (fees and timescale)

Licences are granted by the UKSA to cover:

- a* the launch phase only;
- b* the in-orbit operation for the full lifetime of a satellite; or
- c* both the launch phase and the in-orbit operation.

Licences are granted by the UKSA for individual satellites.

The application fee for a licence for launch or an in-orbit satellite operation is £6,500 per licence. This is a one-off fee, which covers the full-satellite operational lifetime. It is waived if the applicant is an educational institution or if the satellite is for scientific research.

The Guidance recommends that licence applications are submitted at least six months in advance of any plans for launch or operation. The OSA does not, however, set out a legal obligation for the UKSA to complete an assessment of a licence application within a certain period of time.

In practice, the assessment process is completed, on average, in six months. The duration of the licensing process is typically three to nine months.

Conditions of a licence

The UKSA requires the applicant to provide information on its commercial and financial status to ensure that it has adequate financial resources to undertake its intended licensed activities, fulfil its licence obligations, cover the relevant insurance premia and be able to indemnify (in full or in part as per the OSA) the UK government should international liability under UN space treaties arise.

However, there are no specific criteria that need to be demonstrated to satisfy the requirement as to financial status. Two years of certified accounts are generally required by the UKSA to evidence the applicant's financial standing. Accounts information for parent companies may be required if the applicant is a subsidiary. In practice, the UKSA often requires parent company guarantees to be provided by a parent company of the applicant to

guarantee the applicant's financial and performance obligations under the licence.¹⁰ In some instances, a request for funds to be placed in a trust account may also be required by the UKSA as a licensing condition.

The grant of a licence is contingent on the UK government being entitled to:

- a* inspect the launch facilities;
- b* examine the equipment being used in the launch, including the launch vehicle;
- c* obtain all necessary information pertaining to the date and location of the launch and the basic parameters of the intended orbit of the space object;
- d* access documents relevant to the launch;
- e* obtain assurance of adequate environmental protection and that there will be no interference with activities of other states;
- f* obtain assurance that the breach of UK international obligations will be avoided;
- g* obtain assurance as to the adequate protection of UK national security; and
- h* obtain assurance that sufficient insurance cover has been taken out.

Spectrum filing requirements

The national administration representing the UK before the International Telecommunication Union (ITU) is the Office of Communications (Ofcom) by direction of the Secretary of State for Digital, Culture, Media and Sport under Section 22 of the Communications Act 2003. Ofcom carries out the assignment of orbital positions and frequencies and its filing obligations in accordance with the Procedures for the Management of Satellite Filings 2019.¹¹

Applicants for a UKSA licence are required to evidence that they have access to spectrum and that the requirements of the ITU are satisfied concerning orbital positions and frequency assignments. The UKSA will check as to whether orbital positions and frequencies have been assigned to the applicant or are in the process of coordination.

Registration of space objects

On the launch of a space object, the UKSA will provide the licensee with a registration questionnaire to complete, based on the requirements of Article IV of the Registration Convention. The UKSA will then submit this information to the UN on receipt from the licensee.

The UKSA maintains two registries:

- a* the registry of space objects where the UK is the 'launching State' under the Registration Convention and Article VII of the Outer Space Treaty;¹² and
- b* the supplementary registry of space objects¹³ where:
 - licences have been issued but where the UK is not the launching state for that space object (e.g., following the transfer of the space objects to a UK entity by non-UK entities); or

¹⁰ See also Condition 7.1.4 of the template OSA Licence available on the UKSA website.

¹¹ https://www.ofcom.org.uk/__data/assets/pdf_file/0022/140926/new-procedures-1.pdf.

¹² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/823932/UK_Registry_of_Space_Objects_-_August_2019.pdf.

¹³ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/823931/UK_Supplementary_Registry_of_Space_Objects_-_August_2019.pdf.

- it was jointly determined that another launching state should register the relevant space object (e.g., where the UK authorises the launch only and another state registers the satellite that is operated by a non-UK non-governmental entity).

The UK registries contain information as required under the Registration Convention, and additional information, such as the name of the owner or operator and the date of disposal or decay of the space object.

Indemnity, liability and insurance coverage requirements

Before the Deregulation Act 2015 came into force, Section 10 of the OSA required licensees to provide an unlimited indemnity to the UK government for damage or loss arising out of activities carried on by a space object under the licensee's control. The Deregulation Act 2015 placed a cap on the unlimited liability of licensees under Section 10(1A) of the OSA. After the implementation of the Deregulation Act 2015, a licensee must indemnify the UK government against any claims brought against it in respect of damage or loss caused by the licensed space activities up to the capped amount that is specified in their licence.

The standard insurance requirement of the UKSA is that licensees must take out third-party liability (TPL) insurance cover against liabilities arising from each licensed activity (i.e., the launch and in-orbit phases of a mission). It is a requirement that the UK government is named on the insurance policy as an additional insured. For standard missions, the TPL insurance requirement is €60 million.

The UKSA introduced changes to the in-orbit TPL insurance requirement on 1 October 2018 so that where an operator has more than one standard mission, the UKSA may use its discretion to allow all of the operator's standard-mission satellites to be covered under a single 'any one occurrence' TPL insurance policy. The UKSA has further discretion to offer the operator the option to add an aggregate limit (at such level as the UKSA determines to be appropriate) to the operator's per-occurrence TPL policy after a certain number of satellites have been launched by the same operator. The operator's indemnity to the UK government will continue to apply in respect of each licence set at €60 million per licence (with each satellite licensed individually).¹⁴

The UKSA also has the discretion to waive the TPL insurance requirement for low-risk small satellite missions launched to an operational altitude below that of the International Space Station (ISS) although the operator's indemnity limit will remain €60 million per licence (with each satellite licensed individually).

The UKSA defines higher-risk missions¹⁵ as licensable missions that:

- a are novel in nature or scale;
- b use techniques, technologies or systems that are unproven;
- c present a higher risk of high-value TPL claims; or
- d present third-party risks that are not well-characterised.

With regard to the above, the UKSA may require a higher per-occurrence or a higher aggregate TPL limit, depending on the risks of each mission. These requirements will be considered on a case-by-case basis, and are set following an appropriate risk assessment.

¹⁴ See In-orbit insurance at <https://www.gov.uk/guidance/apply-for-a-license-under-the-outer-space-act-1986>.

¹⁵ See What is a 'higher-risk mission'? at <https://www.gov.uk/guidance/apply-for-a-license-under-the-outer-space-act-1986#higher-risk>.

The factors that will be considered by the UKSA during the risk assessment include the:

- a* heritage and reliability of the technology;
- b* orbital parameters;
- c* contingency plans and redundancy of the planned mission;
- d* manoeuvrability of the satellite and the capacity for it to be tracked;
- e* estimated value of satellites in nearby orbits;
- f* orbit-raising and de-orbiting plans, including the value of satellites that may be encountered during the procedures;
- g* operational practices followed by the operator; and
- h* performance of similar space systems on orbit.

Mandatory space debris measures

The Guidance sets out the list of the standards that comprise the criteria by which licence applications are assessed. This includes various international space systems' standards defined by the International Organization for Standardization, international guidelines related to space debris mitigation defined by the Inter-Agency Debris Coordination Committee as well as safety standards defined at European level by the European Cooperation for Space Standardisation.

Despite the Guidance requiring applicants to describe any design feature of the spacecraft in terms of impact protection from debris or micrometeoroids, this is not to be interpreted as a licence condition for satellites to be designed with space debris shields or to have any other impact protection measures. This information is requested as part of the licensing process for information only, rather than to establish a specific requirement from operators, which would be beyond the international debris mitigation measures.

Safety and national security requirements

The UKSA must be satisfied that the intended operations will not jeopardise public health, safety of persons or property and will assess this based on:

- a* system design, functionality and performance;
- b* system qualification, track records and reliability; and
- c* mission risk assessment, including safety plans and procedures, safety requirements and constraints.

The UKSA will also assess whether the proposed activities will compromise national security or the UK's ability to carry out its obligations under international treaties and agreements.

Therefore, the UKSA will only issue a licence on behalf of the Secretary of State for BEIS if public health and the safety of people and property are reasonably protected, the UK's international obligations under the international treaties are adequately protected and UK national security is not impaired.

Monitoring and enforcement requirements

The UKSA has no statutory audit right under the OSA. However, a standard licence contains conditions permitting the inspection of the licensee's facilities, and the inspection and testing

of the licensee's equipment,¹⁶ as well as access to documents and records¹⁷ in the possession or custody of the licensee that relate to the satellite or the licensed activities.¹⁸ A licence is also likely to contain conditions requiring information and updates to be provided to the UKSA by the licensee.

In practice, the UKSA does not carry out formal audits after the licence is granted and instead relies on the obligation of the licensee to notify any changes that may occur over time compared to the licence conditions. The UKSA may also make requests to licensees to confirm that the specific licence information is still valid, such as information in relation to satellite ownership, operational control and TPL insurance cover.¹⁹

ii Transfer of a licence

The UK government requires prior authorisation for both the transfer of ownership and the transfer of the operational control of a satellite. The transfer of a licence is permitted at the discretion of the Secretary of State for BEIS.

The in-orbit transfer of a satellite from a licensed operator to another operator within the UK usually requires the receiving operator to apply for a licence.²⁰

The OSA permits the UK government to enter into agreements with other states under which the UK may cede its jurisdiction over an activity to another state, as long as the UK's obligations under the international space law treaties are fulfilled.

There have been several examples already of space objects being transferred to commercial entities in the UK from entities or international organisations in other states and being added to the UK national space registry. There are also examples of the transfer of a space object from the UK, for example on the sale of a space object, to an entity in another state. In both cases, the transfer has been at an international level through the agreement of states, or the UK and an international inter-governmental institution.

iii Breach of a licence

Under Section 12(1) of the OSA, fines may apply if a person:

- a* launches or operates a satellite without a licence;
- b* knowingly or recklessly makes a statement that is false in a document for the purpose of obtaining a licence;
- c* fails to comply with the conditions of a licence;
- d* fails to comply with a direction given by the Secretary of State for BEIS;
- e* intentionally obstructs the exercise of powers conferred under a warrant issued under the OSA or any related regulations; or
- f* fails to comply with any prescribed regulations.

16 Section 5(2)(a) of the OSA.

17 Section 5(2)(c) of the OSA.

18 Section 5.3 of the OSA space activity licence template provided by the UKSA on its website, accessible at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/744342/Example_of_an_Outer_Space_Act_Licence_Updated_September_2018__002_.pdf.

19 Under Section 6.7 of the OSA Licence Template, the licensee is required to immediately notify the Secretary of State 'of any event or other occurrence which is likely to give rise to a claim under the Insurance Policy'.

20 It may be possible to novate a licence under certain circumstances.

The amount of a fine is not defined in the OSA and is not limited on indictment, but is limited to the statutory maximum.²¹

IV DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

The UK was one of the initial states to adopt national space legislation to regulate the space operational activities of private commercial entities.

The UKSA is one of the first regulators globally to assess the licensing conditions for and grant licences to constellation operators, in-orbit service providers and, shortly, to small launch providers.

It seeks to remain a thought leader in space law and regulation with the implementation of the SIA, which offers many tools to the UKSA and Civil Aviation Authority (CAA) as regulators to achieve the desired outcomes.

The UKSA takes an outcomes-based approach to regulation, rather than a prescriptive approach. It often encourages applicants to develop their own solutions to achieve the regulatory outcomes necessary.

Unlike many regulators, the UKSA's insurance requirements are policy-based rather than prescribed in regulation. This allows quicker adaptation to government requirements as necessary.

A summary of the SIA is provided in Section V.i.

V CURRENT DEVELOPMENTS

i SIA

The SIA regulates space activities, suborbital activities and associated activities carried out in the UK²² through the following categories of licences: operator; launch vehicle operator; satellite operator; spaceport; and range control.

Under the SIA, a single entity will be able to apply for more than one licence. For instance, a spaceport operator will be able to apply for both a spaceport licence and a range control licence.

Operator licence under the SIA

An operator licence will be required for any launch, procurement of launch, operation or return of vehicles capable of operating above the stratosphere (approximately 50km) and any activities that take place above the stratosphere. An operator licence will also be required for any balloon capable of operating within the stratosphere (approximately 10km to 50km) with people aboard.

21 Section 12(2) of the OSA.

22 Section 1(1) of the SIA. See Section 1(4) of the SIA for the definitions of a 'space activity' and a 'suborbital activity', which together are referred to in the SIA as 'spaceflight activities' as per Section 1(6) of the SIA.

Launch vehicle operator licence

Although the Secretary of State for BEIS (whose functions are exercised by the UKSA) is the default regulator under the SIA, the CAA will also be appointed as a regulator. The CAA will regulate suborbital activities whereas the UKSA will regulate space activities including all suborbital or space activities involving the use of rockets.

Satellite operator licence

Once the SIA comes into force, an OSA licence will be needed by UK entities operating a satellite from overseas, whereas a SIA satellite operator licence will be required by UK or foreign entities operating a satellite from the UK.

Spaceport licence

A spaceport licence will be required for the operation of a spaceport, which is defined as 'a site from which spacecraft or carrier aircraft are launched or (as the case may be) are to be launched'²³ or 'a site at which controlled and planned landings of spacecraft take place or (as the case may be) are to take place'.²⁴ This includes both horizontal and vertical launches where the former will be regulated by the CAA together with balloon spaceports and the latter will be regulated by the UKSA.

Range control licence

A range control licence will be required by providers of range control services including tracking, surveillance and boundary control.²⁵ It may be possible to license one or more types of range control service in individual licences. However, the launch vehicle operator will need to obtain all the different elements of the required range control services for a launch.

Liability and indemnity under the SIA

In relation to liability caps and indemnities under the SIA, Section 36 of the SIA removes the cap provided in the Deregulation Act 2015. Section 36(1) of the SIA states that:²⁶

(1) A person carrying out spaceflight activities must indemnify –
(a) Her Majesty's government in the United Kingdom, or
(b) a person or body listed in subsection (2),
against any claims brought against the government, or the person or body, in respect of damage or loss arising out of or in connection with those activities.

However, this is subject to:

- a Section 12(2) of the SIA, pursuant to which an operator licence may specify a limit on the amount of a licensee's liability under Section 36 in respect of activities authorised by the licence; and

23 Section 3(2)(a) of the SIA.

24 Section 3(2)(b) of the SIA.

25 The terms 'range' and 'range control services' are defined in Sections 5 and Section 6(1) of the SIA respectively.

26 With regard to the person or body listed in subsection (2), this includes the Health and Safety Executive, the Office for Nuclear Regulation and the Civil Aviation Authority.

- b* Section 4(4) of the SIA, pursuant to which regulations may provide that Section 36 does not apply to a person to the extent that the person is carrying out activities exempted by or under the regulations, or where regulations may specify the maximum amount of a person's liability.

It is currently unclear what liability cap will apply under the SIA, but the current cap of €60 million is likely to be grandfathered across into the new legislation and policy for standard missions, with the requirement of TPL insurance cover of the same amount.

ii Brexit

The UK public voted to leave the European Union on 23 June 2016. In terms of spectrum management, the UK will no longer be subject to European Commission decisions and initiatives on the harmonisation of spectrum allocations and use across the European Union. In addition, the UK will no longer be included in the EU process for the planning of World Radio Conferences and instead will have a direct unfettered relationship with the ITU with the UK being subject to the full Radio Regulations of the ITU.

The UK's membership of the European Defence Agency will also cease on Brexit unless the UK government negotiates an administrative arrangement that allows non-EU Member States approved by the European Council to participate in its projects and programmes. UK companies will also be excluded from EU space programmes such as Galileo and Copernicus unless a bilateral agreement, similar to those in place with Switzerland and Norway, is reached. In this regard, the UK government published its intention not to use Galileo for UK defence or critical national infrastructure, and its plan to explore alternatives by investing £92 million in an 18-month programme to design a UK global navigation satellite system.²⁷

The UK's memberships of the European Conference of Telecommunications and Postal Administrations and the European Space Agency will not be affected by Brexit as they are organisations independent of the European Union.

VI OUTLOOK AND CONCLUSIONS

The outlook for the UK space industry is bright, and the UK industry, academia and government are collaborating to ensure that this is the case.

The UKSA is now looking to implement thought-leading policies covering close-proximity missions (including in-orbit servicing and active debris removal) and the distribution of Earth observation data. It will also continue to assess requirements for the regulation of large constellations.

The launch of small satellites from the UK in 2021, as anticipated, will be the catalyst for additional commercial vigour within the industry, offering the UK the long-awaited ability to have sovereign launch capability.

To ensure continued success, the UK is looking to create a National Space Programme, and has already established a National Space Council consisting of representatives at the highest levels of government.

We look forward to supporting the industry and government in the future.

²⁷ <https://www.gov.uk/government/publications/satellites-and-space-programmes-if-theres-no-brexit-deal/satellites-and-space-programmes-if-theres-no-brexit-deal#purpose>.

UNITED STATES

*Milton 'Skip' Smith*¹

I INTRODUCTION TO THE NATIONAL LEGAL, REGULATORY AND POLICY FRAMEWORK

The United States has the most robust and detailed national space law and regulatory regime addressing space activities of any nation. Many nations have modelled their laws on those of the United States.

The United States is a party to the four principal UN space treaties: the Outer Space Treaty; the Agreement on the Rescue and Return of Astronauts; the Liability Convention; and the Convention on Registration of Objects Launched into Outer Space. The United States is not a signatory or party to the Moon Agreement. The term 'treaty', as a matter of United States constitutional law, means an international agreement made by the President with the advice and consent of the Senate. In general, a treaty has a status that is equal to a federal statute, superior to a state law and inferior to the Constitution.

Some, but not all, of the space treaties have been the subject of policy, legislation and regulation. For example, pursuant to Article 6 of the Outer Space Treaty,² nations bear 'international responsibility for national activities in space' whether these activities are carried on by governmental or non-governmental entities.³ Moreover, the activities of non-governmental entities in outer space require 'authorization and continuing supervision'.⁴ To fulfil these obligations, the United States has established detailed statutory and regulatory regimes addressing safety, financial responsibility, licensing and other matters.

In the United States, there are numerous governmental actors that address space activities from a regulatory and policy aspect. The National Aeronautics and Space Administration (NASA) focuses on civil space activities, the Department of Defense (DOD) controls government and military space activities, and a number of other federal agencies regulate commercial activities. These agencies include: the Federal Aviation Administration (FAA), which licenses launch, re-entry, spaceport and related activities; the Federal Communications Commission (FCC), which licenses communication frequencies and operating characteristics; the National Atmospheric and Oceanic Administration (NOAA), which licenses remote sensing activities; the Department of State (DOS), which coordinates international interactions, including export control of certain products that are particularly sensitive or could have military uses; and the Department of Commerce (DOC), which

1 Milton 'Skip' Smith is a member of Sherman & Howard LLC. This chapter is adapted and changed from a work originally published in *Colorado Lawyer*, Vol. 47, May 2018.

2 Outer Space Treaty, Jan. 27, 1967, 18 UST. 2410, 610 U.N.T.S. 205, www.state.gov/t/isn/5181.htm.

3 *id.*, at Article 6.

4 *id.*

generally handles export control of space products in the commercial realm. The DOS Directorate of Defense Trade Controls interprets and handles the export control of space products in the defence arena and enforces the International Traffic in Arms Regulations. Presently, no agency regulates on-orbit activities.

II REGULATION IN PRACTICE

This section provides a review of key aspects of the US legal regime applicable to commercial space activities with a focus on (1) commercial space launch, (2) satellite remote sensing of the Earth, (3) satellite communications, (4) NASA activities and (5) space mining. Most of these areas involve US space policy, statutory provisions and extensive administrative regulations. The regulatory regimes have generally worked well and fostered the development of commercial space activities in the United States.

One significant development in US space law was the re-codification of space laws in 2010. Public Law 111-314 enacted a restatement of existing law relating to national and commercial space programmes as a new title of the United States Code. The enactment of Title 51 transferred statutes dealing with space programmes from various United States Code titles and put them in one place.⁵ Most of the laws relevant to commercial use of space are now located at Title 51.

i Commercial space launch activities

Commercial space launch capabilities are important to the United States for many reasons. The 2010 National Space Policy reflects this importance; one of its six goals is to '[e]nergize competitive domestic industries to participate in global markets and advance the development of: . . . space launch[.]'⁶ The 2013 National Space Transportation Policy established five goals, including to '[p]romote and maintain a dynamic, healthy, and efficient domestic space transportation industrial base; [and] [e]ncourage and facilitate the US commercial space transportation industry to increase industry robustness and cost effectiveness[.]'⁷ The 2013 Policy also directs agencies to '[p]urchase and use US commercial space transportation capabilities and services and facilitate multiple US commercial providers of space transportation services across a range of launch vehicle classes, to the maximum extent practicable'.⁸ The United States has done so in many ways, including NASA's use of Space Act Agreements, discussed in subsection iv. Because commercial space launch capabilities are so important, there is a very detailed statutory and regulatory regime applicable to such activities.

The Commercial Space Launch Act (CSLA)⁹ was enacted in 1984 to incentivise the commercial space launch industry. The CSLA and its implementing regulations govern commercial space launch activity. The CSLA empowers the Secretary of Transportation, delegated to the FAA Office of Commercial Space Transportation, to (1) authorise and

5 Detailed information about Pub. L. No. 111-314 is available in the accompanying House Report 111-325.

6 Office of Space Commerce, National Space Policy at 4 (2010), https://obamawhitehouse.archives.gov/sites/default/files/national_space_policy_6-28-10.pdf.

7 Office of Space Commerce, National Space Policy at 2 (2013), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/national_space_transportation_policy_11212013.pdf.

8 *id.*, at 4.

9 Commercial Space Launch Act of 1984, as amended (CSLA) and re-codified in 51 USC Ch. 509 §§ 50901 to 50923.

regulate launch and re-entry activities of licensees consistent with public health and safety, the environment, national security and US foreign policy; (2) impose and enforce insurance and financial responsibility requirements on licensees; (3) encourage, facilitate and promote commercial space launches and re-entries by the private sector; and (4) investigate and penalise violations of the CSLA.¹⁰

The CSLA requires a licence for:

- a* a person to launch a launch vehicle, operate a launch or re-entry site, or re-enter a re-entry vehicle (launch–re-entry activities) inside the United States;
- b* a US citizen to conduct launch–re-entry activities outside the United States; and
- c* a US citizen to conduct launch–re-entry activities outside the United States in certain situations involving a foreign government.¹¹

The CSLA implementing regulations in Title 14 of the Code of Federal Regulations (CFR)¹² establish procedures to obtain a:

- a* launch licence (Part 415);
- b* licence to operate a launch site (Part 420);
- c* licence for launch and re-entry of a reusable launch vehicle (Part 431);
- d* licence to operate a re-entry site (Part 433); and
- e* licence for re-entry of a vehicle other than a reusable launch vehicle (Part 435).

Part 413 of the regulations establishes licence application procedures.¹³ The procedures include guidance on who must obtain a licence or permit, pre-application consultation with the FAA, confidentiality and licence or permit renewal.

Part 440 of the CSLA regulations addresses financial responsibility.¹⁴ The FAA determines ‘the maximum probable loss (MPL) from covered claims by a third party for bodily injury or property damage, and the United States, its agencies, and its contractors and subcontractors for covered property damage or loss, resulting from a permitted or licensed activity’.¹⁵ The MPL is an important concept because the MPL determination ‘forms the basis for financial responsibility requirements issued in a license or permit order’.¹⁶ The licensee or permittee must obtain third-party liability insurance or demonstrate financial responsibility in amounts sufficient to compensate for the MPL.¹⁷ The third-party MPL amounts are established for each licence by the FAA up to a maximum of US\$500 million or ‘[t]he maximum liability insurance available on the world market at a reasonable cost’.¹⁸ Similar provisions apply to claims by the United States, its agencies, and its contractors and subcontractors, with their MPL capped at US\$100 million or ‘[t]he maximum liability insurance available on the world market at a reasonable cost’.¹⁹

10 See generally Commercial Space Transportation, www.faa.gov/regulations_policies/faa_regulations/commercial_space.

11 51 USC § 50904(a).

12 14 CFR Chapter III, Parts 400 to 460.

13 14 CFR §§ 413.1 to 413.23.

14 14 CFR §§ 440.1 to 440.19.

15 14 CFR § 440.7(a).

16 *id.*

17 14 CFR § 440.9(a) and (b).

18 14 CFR § 440.9(c)(1) and (2).

19 14 CFR § 440.9(d) and (e).

Each licensee must also comply with detailed and complex reciprocal waiver of claims requirements.²⁰ This includes signing a cross-waiver of liability with their customers and the US government.²¹ Through these reciprocal waivers each party (1) agrees to be responsible for property damage or loss it sustains, and for personal injury to, death of, or property damage or loss sustained by its own employees, resulting from an activity carried out under the licence; and (2) waives claims it may have against the other parties to the agreement.²² Furthermore, the licensee and its contractors, subcontractors and customers, as well as the contractors and subcontractors of the customers, are also to extend the requirements of the waiver and release of claims, and the assumption of responsibility, to their contractors and subcontractors.²³ Proper implementation and flow-down of these waivers is critical. Failure to do so can lead to indemnity obligations²⁴ and other significant consequences, such as exposing parties to potential liability.

With limited exceptions, the government is authorised, subject to congressional appropriations, to pay successful third-party claims against the licensee, a contractor, subcontractor or customer of the licensee, or a contractor or subcontractor of the licensee's customer, in excess of the amount of the licensee's third-party liability insurance up to US\$1.5 billion.²⁵ In such an event, the President, on the recommendation of the Secretary of Transportation, must submit a compensation plan to Congress recommending the amount of claims to be paid.²⁶

In addition to determinations of financial responsibility, the FAA, with assistance from other government agencies, will conduct policy, safety, payload, and environmental 'reviews' for a proposed activity.²⁷

In a policy review, the FAA 'reviews a license application to determine whether it presents any issues affecting US national security or foreign policy interests, or international obligations of the United States'.²⁸ This may involve interagency coordination with the DOD, the DOS and other federal agencies. The processing of these reviews at the FAA, and at the NOAA, has come under attack from industry owing to long delays, sometimes exceeding one year.²⁹

Safety reviews vary depending on the specific type of activity. The FAA conducts them to determine whether an applicant is capable of launching a launch vehicle and its payload

20 14 CFR § 440.17.

21 Forms for such cross-waivers are found in the FAA regulations. See 14 CFR § 440 Appendices B through E.

22 14 CFR § 440.17. See also 51 USC § 50914(b) (1).

23 51 USC § 50914(b)(2); 14 CFR § 440.17.

24 14 CFR § 440.17(c)(2)(i).

25 51 USC § 50915(a); 14 CFR § 440.19(d). The CSLA requires that the US\$1.5 billion maximum amount that the United States will pay in excess of the licensee's third-party liability insurance be adjusted to reflect inflation. 14 CFR § 440.19(a)(1)(B). The Commercial Space Launch Competitiveness Act of 2015 extended this indemnification of launch providers for extraordinary catastrophic third-party losses through 2025. 51 USC § 50915(f).

26 51 USC § 50915(d).

27 14 CFR Part 415.

28 14 CFR § 415.23(a). See also § 431.23(a).

29 See, e.g., <http://spacenews.com/house-panel-criticizes-commercial-remote-sensing-licensing>.

without endangering public health and safety and the safety of property.³⁰ These reviews generally include analysis of compliance with acceptable flight risk criteria, flight readiness and communication plans, and accident investigation plans and procedures.³¹

The FAA reviews a proposed payload ‘to determine whether a license applicant or payload owner or operator has obtained all required licenses, authorization, and permits . . . to determine whether its launch would jeopardize public health and safety, safety of property, US national security or foreign policy interests, or international obligations of the United States’.³² The FAA does not review payloads regulated by the FCC or the NOAA, or those owned or operated by the US government.³³ The FAA’s environmental review evaluates the environmental impacts associated with a proposed launch or re-entry.³⁴ The applicant must provide sufficient information for the FAA to evaluate compliance with the National Environmental Policy Act³⁵ and other statutes.

The FAA regulations require a launch licence applicant to describe how it will satisfy the FAA’s requirements for avoiding the creation of space debris.³⁶ Among other things, the application must demonstrate efforts to prevent collisions between components of the launch vehicle and the satellite being launched. As described in subsection iii, other government agencies, including the FCC and the NOAA, also require debris mitigation plans.

Part 460 of the FAA regulations details requirements for approval of human space flights. These requirements include requirements for the crew, government astronauts, and ‘space flight participants’, defined as ‘an individual, who is not crew, carried aboard a launch vehicle or reentry vehicle’.³⁷ The CSLA and FAA regulations require crew members and space flight participants to be advised of the risks associated with space travel and to sign waivers releasing the US government and the licensee from any claims arising from injury or property damage associated with their participation in space activities.³⁸ The CSLA protects private spaceflights from additional regulatory oversight by allowing the industry until 1 October 2023 to develop before government regulators will have a substantial role absent a death, serious injury or an event that could have led to a death or serious injury.³⁹

It is important to note that while the CSLA and FAA regulations apply to the launch and re-entry of space objects, there is no regulation of on-orbit operations by the FAA or any agency. Although there have been proposals to assign responsibility for on-orbit transportation to the FAA or another agency, this regulatory gap remains.

30 14 CFR Part 415, Subpart C (Safety Review and Approval for Launch From a Federal Launch Range) and Subpart F (Safety Review and Approval for Launch of an Expendable Launch Vehicle From a Non-Federal Launch Site).

31 id.

32 14 CFR § 415.51.

33 14 CFR § 415.53.

34 14 CFR §§ 415.201 to 415.203, 431.91 to 431.93.

35 National Environmental Policy Act, 42 USC § 4321.

36 14 CFR § 417.129.

37 14 CFR § 401.5.

38 14 CFR §§ 460.9, 460.19, and 460.49.

39 51 USC § 50905(c)(9).

ii Remote sensing of the Earth from space

Remote sensing of the Earth from space⁴⁰ presents significant national security issues. The United States has developed a legal regime based on policies, laws and regulations to accommodate national security concerns and allow the promotion of commercial remote sensing activities. Since 2003, US remote sensing policy has favoured commercialisation.⁴¹ Pursuant to the 2003 US Commercial Remote Sensing Policy, the US government will:

- a rely to the maximum practical extent on US commercial remote sensing space capabilities for filling imagery and geo-spatial needs for military, intelligence, foreign policy, homeland security, and civil users;
- b focus government remote sensing space systems on meeting needs that cannot be effectively, affordably and reliably satisfied by commercial providers because of economic factors, civil mission needs, national security concerns or foreign policy concerns;
- c develop a long-term, sustainable relationship between the government and the commercial remote sensing space industry;
- d provide a timely and responsive regulatory environment for licensing the operations and exports of commercial remote sensing space systems; and
- e enable US industry to compete successfully as a provider of remote sensing space capabilities for foreign governments and foreign commercial users, while ensuring appropriate measures are implemented to protect national security and foreign policy.⁴²

Remote sensing in the United States (other than national security operations) started with the government-built and operated Landsat series of satellites. Although the government still operates Landsat satellites and provides its images for free, remote sensing has developed into a strong commercial industry.

The Land Remote Sensing Policy Act (LRSPA)⁴³ and its implementing regulations⁴⁴ govern commercial remote sensing operations. The LRSPA's purposes include stimulating the development of the commercial market for unenhanced data; furthering the long-term goal of commercialisation of land remote sensing, which will enhance international trade; and promoting widespread access to unenhanced data on a non-discriminatory basis. The LRSPA therefore encourages accessibility to remote sensing data and encourages commercial and scientific cooperation between nations.⁴⁵

The LRSPA authorises the Secretary of Commerce to license private commercial remote sensing satellite systems and provide unenhanced data produced by private remote sensing systems and government systems to foreign governments and other users pursuant

40 Regulations define 'remote sensing space system' as 'any device, instrument, or combination thereof, the space-borne platform upon which it is carried, and any related facilities capable of actively or passively sensing the Earth's surface, including bodies of water, from space by making use of the electromagnetic waves emitted, reflected, or diffracted by the sensed objects'. See 15 CFR § 960.3 (2017).

41 Office of Space Commerce, Commercial Remote Sensing Policy at 4 (2003), www.nesdis.noaa.gov/CRSRA/files/Commercial%20Remote%20Sensing%20Policy%202003.pdf.

42 *id.*, at 2. The 2010 National Space Policy also has provisions related to remote sensing.

43 Land Remote Sensing Policy Act, as amended, 15 USC §§ 5601 to 5672 (Pub. L. No. 102-55 (1992)), as amended in 1998 (Pub. L. No. 105-303); now 51 USC §§ 60101 *et seq.*

44 15 CFR Part 960.

45 *id.*

to commercial terms and conditions.⁴⁶ Operations under these licences must be carried out in a manner to preserve US national security and to observe international obligations of the United States.⁴⁷ The Secretary of Commerce has delegated his authority to the NOAA. Operating requirements of licensees include (1) furnishing complete orbit and data collection characteristics of the remote sensing system, and immediately providing notification of any deviation, and (2) upon termination of operations under the licence, making disposition of any satellites in space in a manner satisfactory to the President.⁴⁸

The NOAA regulations governing licensing of private remote sensing satellite systems are in 15 CFR Part 960. These detailed regulations set forth licensing requirements, prohibitions and enforcement procedures.

The NOAA regulations apply broadly to any 'person', including individuals regardless of citizenship, business entities and private remote sensing systems having substantial connections with the United States.⁴⁹ Appendix 1 to Part 960⁵⁰ provides filing instructions and information to be included in the licence application, which includes: information on the company; launch segment information, such as the launch vehicle, site and schedule; the space segment, including sensor type, spatial and spectral resolution, fields of view for each sensor, and anticipated system lifetime; ground segment, including data collection and processing capabilities, command and mission data frequencies, and methods to be used to ensure integrity of operations; and other information, including plans for providing access to or distributing unenhanced data, information regarding commercial data distribution and pricing, and a plan for post-mission disposition of the satellite. These end-of-life plans are now standard within the industry.

In addition, the licensee must notify and seek approval from the Secretary of Commerce regarding any significant or substantial agreement the licensee intends to enter into with a foreign nation, entity or consortium involving foreign nations or entities, not later than 60 days prior to concluding the agreement.⁵¹ The term 'significant or substantial foreign agreement' is defined as an agreement providing for one or more of the following:

- a* administrative control, which may include distributorship arrangements involving the routine receipt of high volumes of unenhanced data from a licensee's system;
- b* participation in operations of the system, including direct access to the system's unenhanced data; or
- c* an equity interest in the licensee held by a foreign nation or person (or both) if this interest equals or exceeds, or will equal or exceed, 20 per cent of total outstanding shares or entitles the foreign person to a position on the licensee's board of directors.⁵²

46 51 USC § 60121(a) and (e). The LRSPA makes it unlawful for any person who is subject to the jurisdiction or control of the United States to operate a private remote sensing space system without a licence issued by the Secretary. 51 USC § 60122(a).

47 51 USC § 60122(b)(1).

48 51 USC § 60122(b)(4) and (5). In the final rule implementing the LRSPA regulations, NOAA stated it will review post-mission plans on a case-by-case basis. See Licensing of Private Land Remote-Sensing Space Systems, Final Rule, 71 Fed. Reg. 24474, 24479 (Apr. 25, 2006).

49 15 CFR § 960.3.

50 15 CFR § 960 at Appendix 1.

51 15 CFR § 960.8. See also 51 USC § 60122(b)(6).

52 15 CFR § 960.3.

In conjunction with the DOD, the DOS and other relevant agencies, the DOC reviews the proposed agreement in light of national security interests, foreign policy and the government's international obligations. As noted in subsection i, private industry has been critical of the time required to complete these reviews. The LRSPA regulations outline certain requirements such an agreement must meet for approval.⁵³

Consistent with the United Nations' Principles Relating to Remote Sensing of the Earth from Outer Space,⁵⁴ the LRSPA requires a licensee to make available to the government of any country (including the United States) 'unenhanced data' regarding the territory under the jurisdiction of that government as soon as the data are available and on reasonable cost terms and conditions.⁵⁵ Unenhanced data, however, will not be provided if the release is contrary to national security concerns, foreign policy or international obligations, or is otherwise prohibited by law.⁵⁶ Unenhanced data is defined, in part, as 'remote sensing signals or imagery products that are unprocessed or subject only to data preprocessing'.⁵⁷ In addition to the provision of this data to foreign governments, a licensee (and the US government) must provide unenhanced data designated by the Secretary of Commerce to all users without preference or special arrangement regarding delivery, pricing or technical considerations. Unenhanced data, however, may be provided on condition that the data are used solely for non-commercial purposes.⁵⁸

A licensee must also maintain operational control of the remote sensing space system from a location within the United States at all times and allow US government representatives to access its facilities for licence monitoring and compliance inspections.⁵⁹

iii Satellite communications

Communication satellites are used in every country and are the most pervasive commercial use of outer space. Satellite communication systems have extensive international regulation through the International Telecommunication Union (ITU)⁶⁰ as well as national regulations that are consistent with the ITU regulations. In the United States, the Communications Act of 1934, as amended⁶¹ (the Communications Act), combined and organised federal regulation of telephone, telegraph and radio communications. The Communications Act has been amended by many acts of Congress since 1934, most extensively by the Telecommunications Act of 1996.⁶²

The Communications Act created the FCC to oversee and regulate radio communication activities by non-federal government entities, and the FCC applies this

53 15 CFR § 960.8(b).

54 The Principles Relating to Remote Sensing of the Earth from Space, G.A. Res. 41/65 (Dec. 3, 1986), www.unoosa.org/pdf/gares/ARES_41_65E.pdf.

55 51 USC § 60122(b)(2).

56 15 CFR § 960.11(b)(10).

57 15 CFR § 960.3.

58 51 USC §§ 60122(b)(3) and 60141(b).

59 15 CFR § 960.11(b)(2) and (3).

60 The ITU is the specialised agency of the United Nations for communications and information technologies. The ITU allocates global radio spectrum and satellite orbits and develops technical standards to ensure that networks and technologies seamlessly interconnect. About ITU, www.itu.int/en/about/Pages/default.aspx.

61 Communications Act of 1934, as amended, 47 USC §§ 151 et seq. (Pub. L. No. 416 (1934)).

62 See 110 Stat. 56, Pub. L. No. 104-104 (1996).

authority to space activities.⁶³ The FCC's primary function concerning radio communication is to issue licences and develop rules to further the use of radio in the public interest.⁶⁴ The FCC issues licences based on a demonstration that the proposed operations will serve the public interest, convenience and necessity. The FCC may also adopt rules to carry out the Communications Act, or the provisions of 'any international radio or wire communications treaty or convention, or regulations annexed thereto, including any treaty or convention insofar as it relates to the use of radio, to which the United States is . . . a party'.⁶⁵

Part 25 of the FCC's rules provides procedures, technical standards and other requirements for the licensing and operation of facilities used for satellite communications, including ground stations and satellites.⁶⁶ These rules provide technical requirements and enable coordination of satellite systems and spectrum in the United States and internationally to avoid harmful radio-frequency interference. The FCC regulations also address reporting requirements for satellite operators.⁶⁷ The FCC participates in the processes directed by the ITU as the US national administration to the ITU.

FCC regulations address communication satellites operating in the Geostationary Satellite Orbit, where the majority of communication satellites are located, as well as non-geostationary satellites. Geostationary satellites stay in a fixed location relative to the Earth's orbit and can be serviced by stationary antennas. Most geostationary satellites' orbital position and access to spectrum (spectrum filings) are regulated through a 'first-come, first-served' regulatory regime by the ITU and the FCC, which processes licensing applications in the order they are filed with the Radiocommunications Bureau of the ITU.⁶⁸ If an application is acceptable for filing, the FCC, on behalf of the applicant, will make a filing for rights with the ITU, enter into the ITU frequency coordination process and ultimately seek to have the satellite system entered into the ITU's Master International Frequency Register (MIFR). Entry in the MIFR as a conforming assignment provides international recognition and protection against harmful interference from subsequent applicants.⁶⁹

The FCC also regulates non-geostationary satellite (NGSO) systems.⁷⁰ These satellites do not stay in a fixed location relative to their Earth stations. Thus, the Earth stations must track the satellites across the horizon. The FCC first determines whether the NGSO

63 The FCC's authority does not extend to satellite systems owned and operated by US government agencies. 47 USC § 305. The National Telecommunications and Information Administration (NTIA), DOC, has the exclusive authority to manage radio spectrum use by US government agencies and to make frequency assignments to radio stations and classes of radio stations belonging to and operated by the United States. See National Telecommunications and Information Administration Organization Act of 1992, as amended (codified at 47 USC §§ 901 et seq.).

64 47 USC §§ 301, 303. In general, the FCC has jurisdiction only with respect to satellites that communicate with stations in the United States. Thus US citizens are free to operate communications satellites, if licensed by a foreign administration, without FCC authorisation as long as no US landing rights are involved.

65 47 USC § 303(r).

66 See 47 CFR Part 25, Satellite Communications.

67 47 CFR §43.62.

68 47 CFR § 25.158. Some geostationary satellites operate with frequencies and orbital locations that are planned and do not follow the 'first-come, first-served' regulatory regime. See generally, https://www.itu.int/en/ITU-R/space/snl/Documents/ITU-Space_reg.pdf.

69 See generally www.itu.int/en/ITU-R/terrestrial/broadcast/Pages/MIFR.aspx.

70 47 CFR § 25.157.

application is a 'lead application' or a 'competing application'. Public notice is provided, and the FCC ultimately grants applications that meet the standards.⁷¹ The FCC has procedures for situations where there is insufficient spectrum available for all qualified applicants.⁷²

The FCC has adopted rules concerning orbital debris mitigation by satellite systems.⁷³ In adopting these rules, the FCC stated it would help preserve continued affordable access to space, continued provision of reliable space-based services, and continued safety of persons and property in space and on the Earth's surface.⁷⁴ The FCC's rules require a satellite operator to submit an orbital debris mitigation plan to the FCC addressing:

- a* the amount of debris released in a planned manner during normal operations, and the probability of the space station becoming a source of debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal;
- b* accidental explosions during and after completion of mission operations;
- c* the probability of the space station becoming a source of debris by collisions with large debris or other operational space stations; and
- d* the quantity of fuel that will be reserved for post-mission disposal manoeuvres.⁷⁵

Submission of orbital debris plans is becoming standard practice for launch operations and satellite operators.

Over many decades the ITU and FCC regulations have enabled thousands of communication satellites to effectively provide service for direct television broadcasts, mobile satellite services, telephone communications and other uses without harmful radio frequency interference.

iv NASA space activities

One year after the Soviet Union launched Sputnik, the National Aeronautics and Space Act of 1958 (the Space Act)⁷⁶ authorised the creation of NASA. Congress declared that 'it is the policy of the United States that activities in space should be devoted to peaceful purposes for the benefit of all humankind.'⁷⁷ Congress also declared 'the general welfare of the United States requires that the Administration seek and encourage, to the maximum extent possible, the fullest commercial use of space.'⁷⁸

The Space Act identified numerous objectives for NASA, including:

- a* expansion of human knowledge of the Earth and the phenomena in the atmosphere and space;
- b* improvement of the usefulness, performance, speed, safety and efficiency of aeronautical and space vehicles;
- c* establishment of studies of the benefits from and problems involved in the use of space for peaceful and scientific purposes;

71 47 CFR § 25.156.

72 47 CFR § 25.157(d) to (e).

73 47 CFR § 25-114(d)(14).

74 Mitigation of Orbital Debris, Final Rule, IB Docket 02-54, FCC 04-130, 69 Fed. Reg. 54581 (Sept. 9, 2004) (Mitigation Final Rule).

75 47 CFR § 25-114(d)(14).

76 National Aeronautics and Space Act of 1958, as amended, 42 USC §§ 2451 to 2484 (Pub. L. No. 85-568 (1958)); re-codified in 51 USC §§ 20102 to 20164.

77 51 USC § 20102(a).

78 51 USC § 20102(c).

- d preservation of US leadership in space science and technology; and
- e cooperation with other nations.⁷⁹

International cooperation is exemplified by the International Space Station (ISS).⁸⁰ The ISS has a complex legal structure based on an intergovernmental agreement signed by the government partners, four memoranda of understanding between NASA and other cooperating space agencies and numerous bilateral implementing arrangements between space agencies that allow them to get things done. The ISS has been a tremendous success and is now facing issues of what to do next. Privatisation is one option.

The Space Act enables NASA to acquire, construct, improve, operate and maintain laboratories, research facilities, and aeronautical and space vehicles, and other real and personal property, or any interest therein.⁸¹ Additionally, NASA has authority to enter into 'other transactions',⁸² commonly referred to as Space Act Agreements. These Space Act Agreements may be reimbursable, non-reimbursable or funded agreements.⁸³ NASA used funded Space Act Agreements for the Commercial Orbital Transportation System (COTS) and the Commercial Crew Program. The Agreements facilitated the combination of public and private financing, escaped the burdens of the Federal Acquisition Regulations and promoted speed and innovation to secure new capabilities. They also helped SpaceX and Orbital ATK develop commercial space launch vehicles and helped Sierra Nevada Corporation Space Systems company develop the Dream Chaser spacecraft, which has now received a NASA contract to provide cargo delivery, return and disposal services for the ISS.

The Space Act also contains provisions to meet US responsibilities under Article VII of the Outer Space Treaty⁸⁴ and the Convention on International Liability for Damage Caused by Space Objects⁸⁵ regarding the absolute liability to pay compensation for damage on the Earth's surface caused by a US space object. The Space Act authorises NASA to provide liability insurance for any 'user'⁸⁶ of a 'space vehicle'⁸⁷ to compensate all or a portion of claims by third parties for death, bodily injury, or loss of or damage to property resulting from activities conducted in connection with the launch, operation or recovery of the space vehicle.⁸⁸ Additionally, NASA may indemnify a space vehicle user against claims by third parties for death, bodily injury, or loss of or damage to property resulting from activities

79 51 USC § 20102(d).

80 ISS, NASA, www.nasa.gov/mission_pages/station/cooperation/index.html.

81 51 USC § 20113(c).

82 51 USC § 20113(e).

83 NASA's Space Act Agreement authority is implemented in NASA Policy Directive (NPD) 1050.11. Additionally, NASA's 'Space Act Agreements Guide' provides instructions and guidance for developing Space Act Agreements. See NASA Advisory Implementing Instruction (NAII) 1050-1c, https://nodis3.gsfc.nasa.gov/NPD_attachments/NAII_1050_1C.pdf.

84 Outer Space Treaty, see footnote 2.

85 Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24 UST. 2389, 961 U.N.T.S. 187, www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/liability-convention.html.

86 A 'user' of a space vehicle is defined as 'anyone who enters into an agreement with [NASA] for use of all or a portion of a space vehicle, who owns or provides property to be flown on a space vehicle, or who employs a person to be flown on a space vehicle'. 51 USC § 20138(a)(3).

87 A 'space vehicle' is defined as 'an object intended for launch, launched, or assembled in outer space, including the space shuttle and other components of a space transportation system, together with related equipment, devices, components, and parts'. 51 USC § 20138(a)(1).

88 51 USC § 20138(b).

carried on in connection with the launch, operations, or recovery of the space vehicle to the extent that such claims are not compensated by the user's liability insurance. Indemnification may not extend to the user's actual negligence or willful misconduct.⁸⁹

v Space mining

In 2015, the United States adopted the Commercial Space Launch Competitiveness Act (the Act).⁹⁰ The Act, among other things, adopts provisions relating to mining operations on celestial bodies including the Moon and asteroids.⁹¹ Pursuant to this Act, the President, through federal agencies, shall 'facilitate commercial exploration for and commercial recovery of space resources by United States citizens'.⁹² Furthermore, '[a] United States citizen engaged in commercial recovery of an asteroid or space resource . . . shall be entitled to any asteroid resource or space resource obtained, including to possess, own, transport, use, and sell . . . , in accordance with applicable law, including the international obligations of the United States'.⁹³ The Act unequivocally allows US citizens to 'engage in commercial exploration for and commercial recovery of space resources . . . in accordance with the international obligations of the United States and subject to authorization and continuing supervision by the Federal Government'.⁹⁴

The Act further asserts the 'sense of Congress that by the enactment of this Act, the United States does not thereby assert sovereignty or sovereign or exclusive rights or jurisdiction over, or the ownership of, any celestial body'.⁹⁵ Notwithstanding this 'sense of Congress', some scholars contend that recognising the ownership of space resources is itself an act of sovereignty and the Act violates the non-appropriation clause of the Outer Space Treaty.⁹⁶ However, that provision must be read in conjunction with the freedom of use principle of the Outer Space Treaty.⁹⁷ While this scholarly debate may continue, there has been very little official objection to the legislation from countries within the United Nations or otherwise. In fact, in 2017 Luxembourg enacted legislation very similar to the Commercial Space Launch Competitiveness Act.⁹⁸

Space mining is expected to become viable in the near future. How near is debatable. However, it is telling that the Colorado School of Mines recently established the world's first graduate programme in space resources, which offers masters and PhD degrees in this emerging field.⁹⁹ Given the differing opinions on the legality of space mining, perhaps engineers will need to be accompanied by lawyers when they go into space to mine resources.

89 51 USC § 20138(c).

90 Pub. L. 114-90, 129 Stat. 704 (2015).

91 51 USC Ch. 513, Space Resource Commercial Exploration and Utilization.

92 51 USC § 51302(a)(1).

93 51 USC § 51303.

94 51 USC § 51302(a)(3). The 'authorization and continuing supervision' requirement fulfils US obligations under the Outer Space Treaty. See Outer Space Treaty, footnote 2 at Article VI.

95 Pub. L. No. 114-90 § 403, 129 Stat. at 722.

96 See, e.g., Hobe and de Man, 'National Appropriation of Outer Space and State Jurisdiction to Regulate the Exploitation, Exploration and Utilization of Space Resources', *German Journal of Air and Space Law* 460-75 (2017).

97 Outer Space Treaty, footnote 2 at Article 1.

98 Silver, 'Luxembourg passes first EU space mining law. One can possess the Spice,' *The Register* (July 14, 2017), www.theregister.co.uk/2017/07/14/luxembourg_passes_space_mining_law.

99 Space Resources Program, Colorado School of Mines, <http://space.mines.edu>.

III DISTINCTIVE CHARACTERISTICS OF THE NATIONAL FRAMEWORK

As reflected in Section II, one major, distinctive characteristic of the US national framework is the extensive nature of policies, statutes and regulations applicable to commercial space activities. Another distinctive characteristic has been the success the United States has had in developing its commercial space industry. Much of that success is owed to the use of public–private partnerships (P3s). While P3s are associated with a large collection of projects – large to small, complex to simple, high-tech to low-tech – there are some common elements. They have been used fairly extensively and effectively for funding space activities, and are attracting even more attention as sources of public financing grow scarce. It is inevitable that P3s will play a larger role in future space activities.

Examples of P3s for space activities in the United States include NASA’s use of funded Space Act Agreements,¹⁰⁰ discussed in Section II.iv for COTS. SpaceX and Orbital Sciences were awarded COTS Space Act Agreements and, because both companies successfully demonstrated medium-class launch vehicles and cargo capsules, they were subsequently awarded follow-on commercial resupply services contracts in 2008. NASA required SpaceX and Orbital Sciences to share in the cost of the COTS research, development and demonstration, and provided incentives to timely perform. The Space Act Agreements terms and conditions established reasonable cost and risk-sharing, which enabled performance.¹⁰¹ NASA also used Space Act Agreements for its Commercial Crew Program in which it partnered with commercial companies to provide reliable and cost-effective human space transportation to and from the ISS and low-Earth orbit. This multi-phased programme has involved Space Act Agreements between NASA and numerous US companies including Boeing, SpaceX, Sierra Nevada Corporation, Blue Origin and ULA. Funding for the development programmes has been through NASA and the commercial companies. Following demonstrations of capabilities, contracts have been awarded to several companies for certification of commercially built and operated crew transportation systems.¹⁰²

The US Defense Advanced Research and Projects Agency and the US Air Force have used their Other Transaction Authority (OTA)¹⁰³ for programmes similar to Space Act Agreements. OTAs are legally binding agreements that may be used to involve industry and academia in a broad range of research and prototype projects including the option to extend the programme to production.

100 See generally, *Alternative Agreements for Research and Development with NASA*, Briefing Papers, second series, Issue 18-4, March 2018.

101 See generally, *Commercial Orbital Transportation Services: a New Era in Spaceflight*, <https://www.nasa.gov/sites/default/files/files/SP-2014-617.pdf>.

102 See *Commercial Crew Program – The Essentials*, https://www.nasa.gov/content/commercial-crew-program-the-essentials/#.U_ung_ldUn3.

103 10 USC. § 2371 (b) grants the DOD authority to enter into transactions for prototype projects using OTAs, which are legal instruments other than a contract, grant or cooperative agreement. OTAs allow defence and other federal agencies to negotiate terms and conditions specific to their project. OTAs are often used for P3 arrangements and offer flexibility to help agencies attract commercial partners. Such flexibility is not found in standard US government contracts.

IV CURRENT DEVELOPMENTS

Given the tremendous growth in commercial space activities, there are initiatives to streamline some of the extensive regulations and expedite the processing of licence applications by agencies. US space law is likely to mature as the commercialisation of space activities progresses.

At the very end of 2018, legislation aimed at reforming commercial space regulations and extending the life of the ISS failed to win approval in the US House of Representatives (the House). The Space Frontier Act S.3277 won approval in the Senate, but failed in the House. This legislation would have directed reforms in the areas of commercial space launch and remote sensing regulations. Among other things, this bill would have shortened the deadline for the government to render a decision on remote-sensing applications and would have authorised NASA to start a low-Earth orbit commercialisation programme. It is likely that elements of the bill will be considered in the 2019 Congress.

The United States is considering how to regulate activities in outer space, such as satellite serving and commercial lunar missions. No agency currently has formal oversight of these activities to provide the authorisation and continuing supervision required by Article 6 of the Outer Space Treaty. Consideration has been given to providing that oversight responsibility to the Office of Space Commerce within the DOC. Another issue being considered is how to develop industry consensus for standards when approving the safety of space flight participants on commercial spacecraft, including suborbital spacecraft. The FAA is currently restricted from enacting such formal government standards until no earlier than 2023.

Recent changes to the National Space Policy will also impact the direction of space activities in the United States. In December 2017, President Trump signed Space Policy Directive 1, which changed national space policy to provide for a US-led, integrated programme with private sector partners (a P3 arrangement) for a human return to the Moon, followed by missions to Mars and beyond. In May 2018, President Trump signed Space Policy Directive 2, which instructs the Secretary of Transportation and the FAA to devise a new regulatory regime for launch and re-entry activities, and to consider requiring just a single licence for all such commercial operations. It also orders the Commerce Secretary to review regulations on commercial remote-sensing, with the goal of creating a 'one-stop shop' within the Commerce Department for private spaceflight regulation. In June 2018, President Trump signed Space Policy Directive 3, which will guide critical and sorely needed progress on space traffic management. It provides guidelines and direction to ensure that the United States is a leader in providing a safe and secure environment as commercial and civil space traffic increases. This Directive seeks to reduce the mounting threat of orbital debris in the interest of all nations. The Department of Commerce is tasked to lead these efforts, but NASA is also given responsibilities to update the US Orbital Debris Mitigation Standard Practices and establish new guidelines for both satellite design and operation.

Pursuant to Space Policy Directive 2, the Department of Commerce issued an Advanced Notice of Proposed Rulemaking to reform commercial sensing regulations. The Department is actively engaged in rule-making. The FAA also is engaged in rule-making that will reform launch licensing processes. As a result of these efforts, 2019 could see significant changes in the regulation and licensing of remote sensing satellites and commercial space launches.

V OUTLOOK AND CONCLUSIONS

This brief summary of some of the most significant US space laws and regulations offers a glimpse into the complex legal regime governing the use and exploration of outer space in the United States. There are many other US laws that relate to governmental and commercial space activities.

Although international space law flourished in the 1960s and 1970s and has changed relatively little since then, US space law is an evolving and exciting field. The development of a robust commercial space industry will likely continue as the agencies involved in space activities become less of a 'doer' and more of a 'facilitator'. The use of P3s is likely to increase, as is the role of international participation in space activities in which the United States engages.

Companies and agencies are also increasingly likely to evaluate on-orbit services, and rendezvous and proximity operations; the Consortium for Execution of Rendezvous and Servicing Operations, funded by the Defense Advanced Research Projects Agency, is an industry-led initiative to establish technical and safety standards for these on-orbit activities, which could have many benefits including extending the life of satellites and mitigating the creation of space debris.

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ISBN 978-1-912228-79-9