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Law related to space transportation and spaceports

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Introduction

Individuals, scientific research entities, commercial companies and public institutions use space technologies on a daily basis. While space applications require that the necessary instruments are brought into and maneuvered in outer space, other activities, such as experiments carried out by humans in outer space, require that humans and cargo are brought into and back from outer space. Space transportation is therefore an indispensable and crucial element for the realization of space missions.

Recent technical evolutions enable new actors, especially private investors, to participate in space activities and make the space sector even more attractive.1

The following chapter deals with the regulation of space transportation, understood as the means to transport people or cargo to, through, in and back from outer space. This chapter addresses the launch phase, the flight into outer space (often also referred to as operation or guidance of space objects) and the return or removal of the object from outer space, regardless of the application or the purpose of its mission. This chapter also addresses the regulation of spaceports, as those are a necessity for space transportation and as such a prerequisite for any space operation.

Space transportation

“Transport” can be defined as a system or means of conveying people or goods from one place to another.2 Applied to space activities, “space transportation” can consequently be understood as the means to transport people or cargo to, through, in and back from outer space. In the following, different modes of space transportation will be described to illustrate the actual technical background of space transportation. Further, the purpose of regulating such space transportation shall be introduced, as a foreword to general remarks on national legislations

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related to space transportation. Finally, particular aspects of national laws related to space transportation will be described.

**Modes of space transportation**

Space transportation can be conducted in three different contexts and for different purposes.

The first mode of space transportation concerns people or cargo transported from Earth into outer space for the purpose of getting (and staying) there in order to conduct a further activity. In this case, the transportation into outer space is solely a means, and the objective of the transportation is the delivery to a pre-defined station in outer space. Examples of this are the transportation of people or cargo to the International Space Station (ISS), or the transportation of satellites, probes or other space objects into their dedicated orbit.

Second, cargo that has been transported into outer space may itself continue its existence as transportation vehicle. This is the case for satellite buses carrying instruments for telecommunication, remote sensing or any other application. As such, satellite buses transport the mission instruments in a dedicated orbit (position) through outer space. In this case, the transportation is the purpose of the activity. Aspects related to this kind of transportation are irrespective of the instruments carried on the bus and the application conducted by it.3

Third, people or cargo can be transported into outer space, through outer space and back to Earth without leaving the transportation vehicle as such. The purpose of the activity is to bring people or cargo into outer space and back for a defined and limited period of time, meaning transportation is again the sole purpose of the activity. Examples for this are tourist flights; transporting fee-paying passengers from a point on Earth to an altitude regarded to be outer space, and back to Earth, either to the point of departure or to a different one.4 Currently, such flights are (planned to be) carried out as suborbital flights, with a parabolic flight path through outer space, meaning those flights do not achieve an orbit around the Earth. Another example of this kind are sounding rockets, carrying experiments to be conducted in weightlessness.

It follows that one may differentiate between transportation from Earth to outer space, transportation from Earth to outer space and back to Earth, and transportation within outer space (including end of life disposal). In the first two cases, the transportation service may be provided by a third party who is different from the transported person or owner of the transported good. In the last scenario, this is not necessarily the case. In any case, a mode of transportation into outer space is necessary, be it as a sole purpose or a means for conducting further activity. The following shall demonstrate that different considerations can be applied with regard to these different transportation modes.

**Purpose of regulating space transportation**

In many jurisdictions entities conducting space transportation are subject to regulatory control, for example through certification. Every State may have its particular reasons to regulate such

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3 The application itself and legal aspects related to it are dealt with in Chapters 6 to 8 of this handbook.

activities, be it to ensure a certain level of safety for the people or goods on board such transportation vehicles, to ensure a certain level of safety for third parties (people and goods) on the ground or during flight (aircraft or other objects in outer space), or to ensure a level playing field among the organizations subject to the same regulations.

From an international law perspective, two other fundamental reasons for a State to regulate space transportation are to be found in 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 (OST) and especially Articles VI and VII thereof, which are discussed in greater detail below.

Description of some national laws related to space transportation

General remarks

Rules applicable to space transportation are commonly contained in more general space acts, bearing such titles as “space activities bill”, “outer space act”, “[State] space law”, “law on space operations” or similar. In most instances, the requirements set forth by those national legislations are the same for all aspects of transportation as dealt with in this chapter, i.e. the launch, the operation and the return of the space object. Most of those acts also address other aspects of space activities (i.e. telecommunication, navigation, remote sensing or other kinds of space application), which would be outside the scope of this chapter. A dedicated act for launching activities only exists in the US (49 USC. Chapter 701 Commercial Space Launch Activities; CFR 14 III §§ 400 et seq., Commercial Space Transportation), while other space activities under US jurisdiction are regulated in other acts. Similarly, the Australian Space Activities Act contains a chapter dedicated to launches (and returns).

National laws regulating space activities have been enacted in numerous States: United States, Norway, Sweden, United Kingdom, South Africa, Russian Federation, Ukraine, Australia, Hong Kong, Brazil, Belgium, South Korea, the Netherlands, France, Austria and Kazakhstan. The scope of most of these laws includes space transportation and those pieces of legislation are therefore relevant to the present chapter. References to and consolidated analysis of those acts have already been provided by numerous authors. In addition to those “space laws” stricto sensu, some States have adopted regulation on specific aspects of space activities, such as Canada (authorization), Argentina and Spain (registration) and Italy (liability). There are cases where space applications are being legislated, even though there is no general “space law”. For example, Germany has enacted an authorization procedure for the marketing of high qualified remote sensing data. This, however, does not constitute an authorization in the sense of Art. VI OST.

The purpose of the following is to provide a general overall overview of the dispositions of a number of selected jurisdictions.

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5 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, 27 January 1967, 610 UNTS 205.


7 Gerhard, supra note 6 before MN 1; Isabelle Reutzel, das Weltraumrecht in Europa: Eine Analyse der nationalen Regelungen zur Raumfahrt (Bern: Peter Lang, 2014).
United States of America

In the US, the operation of launch and re-entry sites is dealt with in 49 USC Chapter 701 as further implemented by 14 CFR. Chapter III, §§ 400 et seq., in particular Part 413 and Part 415 (launch license and safety), Part 431 (Reusable Launch Vehicles) and Part 437 (Experimental permits).

The Act applies to the launching of a launch vehicle or to the re-entry of a re-entry vehicle in the US. It applies to launches or to re-entries outside the US, if conducted by a US citizen or by an entity organized or existing under the laws of a US State or county. Finally, the Act applies under certain circumstances to foreign entities in which a US citizen or entity holds the controlling interest.

The Act differentiates between launch-specific licenses and launch operator licenses. Launch-specific licenses authorize the licensee to conduct one or more launches, having the same parameters, of one type of launch vehicle from one launch site. Launch operator licenses authorize a licensee to conduct launches from one launch site, within a range of launch parameters, of launch vehicles from the same family of vehicles transporting specified classes of payloads.

Launch licenses will be issued after policy and safety approvals have been obtained, after a payload review and after compliance with environmental requirements is assessed. Furthermore, the applicant must demonstrate compliance with the financial responsibilities and allocation of risk requirements set forth by the Act. Licenses for a reusable launch vehicle and a re-entry license will be issued under similar requirements. Experimental permits can be issued for research and development to test new design concepts, new equipment or new operating techniques, to demonstrate compliance with requirements for obtaining a license and for crew training before obtaining a license. The specific requirements for commercial human spaceflight as laid down in Part 460 (are further described in Chapter 9 of this handbook).

The policy approval is subject to a determination by the FAA whether a proposed launch could jeopardize US national security or foreign policy interests, or international obligations of the US. The applicant shall identify the model and configuration of any launch vehicle proposed for launch, identify structural, pneumatic, propellant, propulsion, electrical and avionics systems used in the launch vehicle and all propellants, identify foreign ownerships and identify proposed launch vehicle flight profile(s). For its determination, the FAA consults with the Department of Defense, the Department of State and other federal agencies, including NASA. The policy approval may be applied for separately and in advance.

The safety approval is subject to a determination by the FAA whether an applicant is capable of launching a vehicle and its payload without jeopardizing public health and safety and safety of property. The applicant has to demonstrate that he maintains a safety organization, that the flight risk meets the acceptable risk level, that a flight readiness and communication plan exists and an individual responsible for flight readiness has been assigned. Additionally, the applicant must also demonstrate safety of all launch vehicle stages or components that reach Earth orbit (in particular that there will be no unplanned physical contact between the vehicle or its components and the payload after its separation and removal of stored energy), and the existence of a plan to report and respond to launch accidents, incidents or other mishaps. The safety approval may be applied for separately and in advance, as well.

8 Following the requirements of the National Environmental Policy ACT, 42 USC 4321, as further implemented by 40 CFR parts 1500–1508.
9 These requirements, as described in Part 431 and Part 435 will not be described in detail.
10 These requirements, as described in Part 437 will not be described in detail.
A payload review aims at determining 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. It is required unless the payload is exempt from such a review. The review can be requested from the launch license applicant or from the payload owner or operator. It may be requested in advance of or apart from a launch license application. The FAA conducts its determination on the basis of the information submitted by the applicant, in particular the payload name and class, its physical dimensions and weight, its owner and operator, the orbital parameters for parking, transfer and final orbits, hazardous or radioactive material that may be contained, its intended operations during the life of the payload and delivery point in flight at which the payload will no longer be under the control of the launch licensee. For its determination, the FAA consults with the Department of Defense, the Department of State and other federal agencies, including NASA.

The licensee has the obligation to keep records and to report to the FAA. He shall also support the US government in implementing Article IV of the 1975 Convention on Registration of Objects Launched into Outer Space, by providing the necessary information about objects launched into outer space. The license can be transferred by the FAA, if the transferee has obtained the necessary approvals and determinations required, as seen above.

The licensee has the obligation to insure the lesser of the maximum probable loss of the licensed activity or $500 million (adjusted for inflation), and to indemnify the United States for liability, loss or damage sustained by the US exceeding $1,500,000,000 (also adjusted). The maximum probable loss will be determined (by the Associate Administrator for Commercial Space Transportation of the FAA) as laid down in the Act. Furthermore, the licensee has to comply with the reciprocal waiver of claim requirements as set forth in the Act.

The United Kingdom

The 1986 UK Outer Space Act\[11\] is applicable to launching or procuring the launch of space objects, operating a space object and any activity in outer space, if conducted by a UK national, Scottish firm or bodies incorporated under the law of the UK, irrespective of whether the activity is carried on in the UK or elsewhere. The Act does not differentiate between the launch and the operation of a space object. It remains general and sets forth the same requirements for both.

An organization conducting space transportation has to hold a license to carry out such activities. The essential requirements set forth by the Act are that the competent authority (Secretary of State and UK Space Agency) must be assured that the activity will not jeopardize public health or the safety of persons or property, will be consistent with the international obligations of the UK and will not impair the national security of the UK. The first two requirements are linked to obligations of the UK stemming from Articles VI and VII of the OST. The competent authority can grant the license subject to conditions, for instance to ensure proper oversight over the organization. The Act suggests conditions allowing the authority to inspect the licensee’s facilities, to carry out inspection and testing of the licensee’s equipment and to terminate the license in specific circumstances. The Act explicitly mentions conditions related to the prevention of contamination of outer space or adverse changes in the

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\[11\] Act to Confer licensing and other powers on the Secretary of State to secure compliance with the international obligations of the United Kingdom with respect to the launching and operation of space objects and the carrying on of other activities in outer space by persons connected with this country. The Act was amended by Section 12 of the Deregulation Act 2015.
Earth environment, as well as avoidance of interference with activities of others in the peaceful exploration and use of outer space. These are examples of conditions aimed at ensuring the UK’s compliance with Article VI of the OST by confirming that the activities of the licensee are carried out in conformity with the OST (Article VI first sentence). Furthermore, the competent authority may require the licensee to obtain third-party liability insurance. This condition is targeted to also limit the risk of the UK being held liable according to Article VII of the OST. In practice, the competent authority limits the insurance cover in the majority of cases to €60 million. Finally, the competent authority may require the licensee to ensure the disposal of the payload in outer space on the termination of operations. This condition related to the avoidance of space debris does not exist in many other jurisdictions.

An applicant has to pay a fee of £6,500 for the obtention of a license. The government has published the application form for such a license online, as well as guidance for applicants and a database of standards, being the criteria by which the application is judged. The guidance includes a list of minimum information required and description of the licensing procedure. For space transportation issues it is noteworthy that the guidance includes particular questions related to launching activities, to which an applicant must respond.

From an administrative point of view, it is worth mentioning that the Act allows the license to be transferred with the consent of the competent authority. Furthermore, the Act entitles this authority to give enforceable directions to the licensee and to revoke, vary or suspend the license with the consent of the licensee or where it appears that a condition of the license or any regulation made under the Act has not been complied with, or if required in the interest of public health or national security, or to comply with any international obligation of the UK. It finally establishes offences under the Act.

With regard to the potential liability of the United Kingdom under Article VII of the OST for damages caused by a person to whom the Act applies, the Act establishes an obligation to indemnify the government.

**Australia**

The Australian Space Activities Act was adopted in 1998.

The Act applies to space activities, and Part 3 of the Act specifies in detail which activities are regulated and require approval. Amongst those explicitly mentioned are launches conducted in Australia, overseas launches, if an Australian national is a responsible party for the launch, the return to Australia of Australian-launched and overseas-launched space objects and the operation of a launch facility in Australia. Different from many other laws regulating space activities, the Australian Space Activities Act only focuses on the launch and return of space objects. There are no specific requirements set forth for the operation of space objects, other than those implicitly covered by the authorization of the launch.

An organization conducting space transportation from Australia has to hold a launch permit. The competent authority (the Minister and the Space Licensing and Safety Office) may grant

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13 Ibid.

the permit if the applicant complies with the requirements set forth in the Act. The applicant has to be competent to carry out the launch, must comply with insurance requirements (covering the maximum probable loss, but at least AUS $750 million), or has to demonstrate its financial responsibility for the launch. It has to be established that the probability of the launch causing substantial harm to public health or public safety or causing substantial damage to property is as low as reasonably practicable. These requirements aim at limiting the risk of Australia being held liable according to Article VII of the OST. Furthermore, the Act contains requirements such as, for example, not to carry nuclear weapons or weapons of mass destruction, and that the competent authority does consider that the launch permit shall be granted for reasons relevant to Australia’s foreign policy or international obligations. This again aims at ensuring Australia’s compliance with Article VI of the OST by ensuring that the activities of the licensee are carried out in conformity with the OST. With regard to the possibility that other States are also launching States for the launch for which an application is submitted, the Act calls the competent authority to also consider whether there is an agreement between Australia and other launching State(s), under which the country assumes any liability, and indemnifies Australia, for any damage that the space object may cause. Very similar requirements are established by the Act for an Australian organization conducting space transportation from overseas.

An applicant has to pay a fee, for example AUS $10.000 for an overseas launch certificate. The Australian government has published guidelines for applicants online.\footnote{Industry, “Australian Civil Space” online: Australian Government, Department of Industry, Innovation and Science www.space.gov.au/SPACELICENSINGSAFETYOFFICE/Pages/SpaceActivitiesGuidelinesforIndustry.aspx.}

The competent authority (i.e. the appointed Launch Safety Officer) is entitled to oversee the licensed launch, for example by entering and inspecting the facility and any space object at the facility, by inspecting and testing any equipment at the facility, by requesting any information and assistance and by giving directions about the launch.

Furthermore, the Act entitles the competent authority to suspend, revoke or transfer the launch permit, if the competent authority considers that there are grounds to do so. It finally establishes what are offences under the Act.

With regard to the potential liability of Australia under Article VII of the OST for damages caused by a person to whom the Act applies, the Act establishes a differentiated obligation of indemnification of the government by that person. In the first place, the responsible party has no obligation to indemnify the government for any damage exceeding the insured amount (covering the maximum probable loss, but as minimum AUS $750 million). Only if the damage exceeds AUS $3 billion is the government entitled to receive indemnification of any amount in excess.

\section*{France}

The French Space Operations Act,\footnote{Loi n° 2008-518 du 3 juin 2008 relative aux opérations spatiales, Journal Officiel de la République Française (4 June 2008).} adopted in 2008 and in force from 2010 marks a turning point in the legislative field of space activities. An early space power, especially because of the good location of the launch site in Kourou in French Guiana, France had long been entertaining a legal “French paradox”,\footnote{Reutzel, supra note 10 at 72.} according to which more and more (private) space
activities were taking place from the French territory without being subject to any specific legislation. Those activities were being organized according to a set of national and contractual measures resulting mainly from France’s international commitments. Besides the international space law framework, those were the Ariane Agreement of 21 September 1973 between France and the European Space Agency (ESA) about the development of the Ariane Program delegated to CNES (the French space agency) and the Declaration between the Ariane Exploitation Phase Participating States of 14 January 1980. The first consisted of specific international agreements with ESA on the facilities of the Guiana Space Centre (which became the legal basis for the safety rules (“sauvegarde”) for the launch base), while in the second those States give ESA the mandate to conclude an arrangement with private operator Arianespace to implement the exploitation phase. The development phase is still governed by ESA rules. This arrangement set forth several conditions regarding the liability of the operators, which the French Space Act of 2008 builds upon. The adoption of the Act enables the French government to achieve a balance between responsibility and liability according to Articles VI and VII of the OST and the development of private space activities on and from its territory by setting up a coherent national regime to authorize and monitor space operations under French jurisdiction.

The national corpus juris applicable to space operations carried out under French jurisdiction and for which France is internationally liable and responsible according to international space law is composed of a main space act and three further application decrees, dealing respectively with authorization aspects, the French Space Agency and space-based data.

The Act is applicable to space operations. Space operations encompass any activity consisting of “launching or attempting to launch an object into outer space, or in ensuring the commanding (control) of a space object during its journey in outer space (...) and, if necessary, during its returning to Earth”. The definition shows there is no distinction made in principle between the different kinds of space operations and that the Act is applicable to space transportation. It is interesting to note that the Act defines the launching phase as the “period of time which starts when the launching operations become irreversible and which ends when the object to be put in outer space is separated from its launching vehicle”, and the command phase as the “period of time which starts when the object to be put in outer space is separated from its launching vehicle and which ends when the first of the following events occurs: the final manoeuvres of de-orbiting and passivation activities have been completed; the operator has lost control over the space object; the return to Earth or the full disintegration of the space object in the atmosphere.”

The Act requires the operator of such activities to hold an authorization or license delivered by the administrative authority (i.e. the Ministry in charge of Space Affairs, in close cooperation with the French Space Agency CNES, in charge of the technical control of the systems for which the authorization is applied for). Operations carried out in the scope of a

18 Marboe/Hafner, supra note 9 at 39.
“public mission” (governmental programs, science, development of space systems) carried out by CNES are excluded from the scope of the Act. CNES nonetheless applies the technical regulations and monitors their observance through internal independent procedures on a voluntary basis, as exemplary values. It is also interesting to note that if the launch of a space object is being procured by a non-French operator through the services of a French launching operator, only the latter shall apply for an authorization to launch.\footnote{22} Furthermore, the transfer of control of a space object requires authorization, if the object has initially been authorized under the French Act. Similarly, if a French operator wishes to take control of a space object not primarily authorized under the French Act, he has to apply for an authorization to do so.

In order to be issued, an authorization operators have to demonstrate moral, financial and professional guarantees. Financial guarantees can consist either in financial autonomy or in the need to hold insurance coverage for the duration of the space operation. Regarding the amount to be insured, this element is viewed in close relationship with the question of third-party liability below. Authorizations will not be granted if the interests of national defense or international commitments may be jeopardized.

On the technical side, the dispositions of the three sets of technical regulations must be complied with.\footnote{23} They are based on the practices of CNES, improved by decades of experience in space operations. One is applicable to launch operations, the second to satellite operations (in-orbit command and re-entry) and the last concerns safety regulations at the Guiana Space Centre (Reglement d'Exploitation des Installations du Centre Spatial Guyanais). The main features of these regulations are set to be as close as possible to the practices of the space industry regarding the safety of persons and property, the protection of public health and of the environment. The regulations set objectives to be reached by the operators rather than mandatory procedures. They are based on international norms and standards.

The application for authorization foresees that the applicant, demonstrating a general notification of compliance with the Technical Regulation, prepares a technical file. Also an audit on the internal standards and quality management provisions must be provided. All measures taken by the applicant regarding surveys of hazard and risk control plans aimed at ensuring the safety of property and people and to protect public health and the environment must be set. Environmental impact studies and measures designed to avoid, reduce or offset harmful effects on the environment must be made, including a risk prevention plan relating to risks caused by the fallback of the space object or any fragment thereof. This plan includes a prevention plan relating to environmental damage, a space debris mitigation plan, a collision prevention plan, and a nuclear safety and/or planet protection plan (if applicable). Finally, risk management and emergency measures envisaged also must be stated. Specific technical requirements are also applicable relating to mission analysis; flight dynamics and mission robustness; onboard neutralization capacities; flight data record capacities; general safety objectives; objectives concerning nominal stages of re-entry, including the non-creation of debris, and collision risks avoidance.

In certain circumstances, operators can apply for an exemption of the technical assessment. This is the case for example for foreign launch services purchased by French operators. If the


space operation is to be carried out from the territory of a foreign State, or means or facilities falling under the jurisdiction of a foreign State, the Space Department of the French Ministry for Space Affairs may exempt the applicant from all or any part of the technical regulations compliance check, when the national and international commitments of that State, as well as its legislation and internal practices, provide sufficient guarantees regarding the safety of persons and property, the protection of the public health and the environment and liability matters.

In order to facilitate the issue of an authorization, “administrative licenses” attesting the moral, financial and professional guarantees of the applicant can be issued, so that the final authorization can be granted for each single operation on a case-by-case basis on the sole control of the technical conformity. “Technical licenses” certifying the technical conformity of generic systems and procedures used can also be issued. The final authorization will then be issued on a case-by-case basis. Finally, “licenses equivalent to authorization” may also be granted in the case of orbital systems: those consist only of an obligation to inform regarding the beginning of the operation one month prior to commencement.

Once authorization has been granted, the holder of the latter has to comply with several dispositions to enable the monitoring of the space operation. The relevant provisions of the authorization and the corpus juris must be observed during the carrying out of the operation and CNES must be informed of any relevant events of failures. Special agents and controllers are granted prerogatives to ensure the provisions of the authorization and the Act are respected. Their prerogatives reach from compliance checks during the application procedure to permanent access to buildings, premises and facilities where operations are conducted as well as suspension of the authorization. Also diplomatic and administrative authorities are entitled to take emergency measures aiming at protecting people, property, public health and the environment, which may result for example in the destruction of the rocket if need may be. Failure to respect the provisions of the authorization or violation of the applicable legislation may result in withdrawal or suspension. In addition, the Act also prescribes fines up to €200,000 for launching or operating space objects without an authorization or in breach of relevant administrative measures. The same rules apply for taking possession or transferring command of a space object without authorization.

Regarding third-party liability, the purpose of the Act is to concentrate the burden of liability on the operator and is inspired from the concept of State liability as established by the 1972 Convention on International Liability for Damage Caused by Space Objects\(^{24}\) (LIAB): the operator is absolutely liable for damages which occur on ground and in the air space, and liable in case of fault for damages caused in outer space. In this regard, the French Act introduces a differentiation between the launching phase and the command phase, which is not foreseen for State liability by the LIAB and aimed at apportioning the liability. Furthermore, the operator can be held liable only for a limited period of time. Finally, liability is apportioned between the French State and the operator: in the event of an operator – holding an authorization under the French space Act – being condemned by a domestic or foreign court, or in the event of the French State being held liable under the LIAB because of damage caused to a foreigner, a guarantee of the French State is granted for indemnification sums exceeding the amount fixed in the French Finance Law of 2008 (approximately €60 million). Logically, the French Act imposes the duty of insurance up to this ceiling (or equivalent financial guarantees).

Belgium

The Belgian Law of 2005\textsuperscript{25} supplemented by a Royal Decree\textsuperscript{26} about the activities of Launching, Flight Operation and Guidance of Space Objects, and revised by the law of 2013 enables the Belgian Government to ensure the legality and material safety of operational space activities performed under Belgian jurisdiction. It also develops an appropriate legal framework for the development of such activities in Belgium by implementing a registry for space objects and avoiding liability that could arise under application of the OST.\textsuperscript{27} Activities covered under the law are “launching, flight operations and guidance of space objects” carried out by natural or legal persons in the zones placed under the jurisdiction or control of the Belgian State or using installations or property (personal or real) owned by the Belgian State or which are under its jurisdiction or its control. The application of the Belgian law can be extended by the means of an international agreement to any such activities carried out by Belgians, irrespective of the location where such activities are carried out. This provision conforms to a pragmatic understanding of the OST and enables Belgium to regulate space activities that might otherwise not fall under the scope of another space law. With this scope of application, it is obvious that space transportation is at heart of the Belgian law. Next to the launch, flight operation and guidance also fall into the scope of the law, consisting of any operation related to delivery in orbit, flying conditions, navigation or evolution of the space object in outer space, such as selection, control or correction of its orbit or trajectory. The return to Earth is not explicitly stated in the application field.

Similar to other national space legislations, such activities must have prior authorization from the Minister for Science Policy through the operator having effective control of the space object. Authorizations are delivered and held personally and as such cannot be subject to transfer without prior consent by the Minister. It is explicitly stated that such activities are to be conducted according to international (space) law. The authorization regime aims at ensuring the safety of people and property, protecting the environment, ensuring the optimal use of air space and outer space, and protecting the strategic, economic and financial interests of the Belgian State. It also satisfies the Belgian State’s obligations under international law. The King and the Minister in charge can add further conditions. They may in particular impose the technical assistance of a third party, lay down conditions relating to the location of the activities or the location of the main establishment of the operator or create an obligation for insurance to be taken out in favor of third parties to cover damage that may result from authorized activities.

The law foresees a list of information that must be attached to the application for authorization, for which a standard form is prepared and made available online. An initial study is to be carried out to assess the potential impact of launching or operating the space object on the


environment of Earth or in outer space. This study has to be conducted before the authorization is granted, but also at an intermediate stage, and may also be carried out when the object returns to the Earth's atmosphere. The use of nuclear energy must be disclosed in the application.

The authorization or its refusal will be notified within 90 days of application or 120 days if additional information is required. Experts designated by the Minister are charged with controlling the activities through access to relevant documentation and facilities. In the event of an infringement of the law or of non-compliance of the conditions set forth by the authorization, the latter can be withdrawn or suspended by the Minister. This applies also in the case of imperative reasons relating to public order, the safety of people or property. When the authorization is withdrawn or suspended after the space object has been launched into outer space, the Minister shall take all necessary measures in order to guarantee the safety of the operations, both with regard to the operator and his employees and third parties, as well as to ensure the protection of property and the environment. To that end, he may call upon the services of third parties or transfer the activities to another operator to ensure the continuity of flight and guidance operations and, if necessary, take action to deorbit or destroy the space object.

Finally, the law introduces a system of sharing the liability for the damage caused by the space object between the Belgian State and the operator. This system is based on the liability of the operator, which is limited to a certain amount. Any person carrying out activities regulated by the law without authorization shall be subject to a period of imprisonment up to one year and or a fine of up to €25,000.

The Netherlands

In the Netherlands, space activities are covered by the Space Activities Act, the Rules concerning Space Activities and the Establishment of a Registry of Space Objects from 2006.28 This Act deals with private space activities for which the Dutch State can be considered responsible and can be held internationally liable according to international space law. The Act regulates registration, authorization and supervision of national space activities and organizes the regress of the State towards the operator in case of liability.29 The Act does not apply to the six non-European islands for which the Kingdom of Netherlands retains jurisdiction.30 For the purpose of the Act, space activities encompass the “launch, the flight operations and the guidance of space objects in outer space”, performed in or from within the Netherlands or else or from a Dutch ship or Dutch aircraft, whereas the procurement of a launch and the operation of a launch facility are not covered by the Act. The Act may also be applied to Dutch nationals in the event of space activities being conducted from the territory of a State not party to the OST.

Under the Act, space activities shall not be conducted unless the Minister of Economic Affairs issues a license for this purpose. The implementation of the Act belongs to the domain of the national Telecom Agency. The Act lists a number of regulations or restrictions that the competent authority may attach to the license, for example for the purpose of the safety of persons and goods, the protection of the environment in outer space, financial security,
protection of public order, security of the State and the fulfillment of international obligations of the State. Furthermore, the Act describes that the license may be refused if such a license has been revoked owing to infringement of rules laid down or pursuant to the Act or if the applicant has not discharged his obligations under a previously issued license or if the applicant does not comply with the Act. Finally, the applicant has to have and maintain a maximal possible cover for the liability arising from the space activity that can reasonably be covered by insurance as determined by the Minister.

For the issue of a license, audits are conducted regarding the technical, legal and financial state of the activity. A decision on the delivery of the license has to be made within six months. The license can be revoked for the same reasons as it can be denied or if the conditions under which the license had been obtained have changed substantially. While the license is not transferable, the name entered in the registry may be adjusted if this corresponds to the legal form of the license-holder.

In case of disasters or if an incident occurs or has occurred that may jeopardize the safety of persons and goods, environmental protection in outer space, the maintenance of public order or national security, or otherwise cause damage, the license-holder shall immediately take reasonable measures to prevent or limit the consequences of that event. Finally, penalties are also foreseen for the infringement of the law.

Regarding liability, the Act states that the State is entitled to recover from the person whose space activity has caused the damage, for any sum it has to pay under application of Article VII of the OST or of the LIAB. In consequence, the license-holder is liable for damages caused by its space activities, up to the value of the sum insured.

**Analysis**

The analysis of the regulations reviewed above identifies a number of commonalities – often referred to as “building blocks” – especially because of their common international law background.

This is definitely the case for the transportation in outer space, that is where the satellite bus being considered a transportation vehicle. *De facto*, the international law background is also relevant for transportation from Earth to outer space, though one may have doubts whether Article VI of the OST directly applies to such transportation. When the OST speaks of “activities in outer space”, it is questionable whether only activities completely taking place in outer space are mentioned.\(^{31}\) This would exclude launches of space objects. However, none of the national space laws analyzed above have opted for such a restrictive interpretation. All such laws are applicable to the launch of space objects and basically set the same requirements for launches as they do for activities in outer space. Contrary to this, it is very much discussed whether the OST is also applicable – at least partly – to the last mode of transportation stated, that is transportation from Earth to outer space and back to Earth. The present chapter will not deal with this question. However it can be noticed that one State explicitly includes this mode of transportation in its legal framework, namely the US.

National laws relating to space activities establish authorization requirements, many of which are directly related to the obligations set forth in the OST, such as the obligation to avoid harmful contamination of outer space and adverse changes in the Earth environment (Article IX second sentence OST). Furthermore, all such national laws contain a “catch-all clause”

\(^{31}\) Gerhard, *supra* note 17 at 69; Reutzel, *supra* note 10 at 91.
ensuring that all private space activities are carried out in conformity with the OST. Through this mechanism, the dispositions set forth by the OST—even though an international treaty—are relevant for private actors.32

In addition, the laws reviewed define a legal basis for the competent authority to assess compliance with the law as well as with any conditions set forth by the authorization. Handling means (e.g., access rights, information obligations) and reaction measures in case of non-compliance (e.g., suspension or revocation of the authorization, fines and penalties) can also be entrusted to the implementing entity. Furthermore, such laws deal with the registration of objects launched into outer space. However, this is only relevant for that form of space transportation where the transportation vehicle remains in outer space, as registration measures only apply to objects launched into an Earth orbit or beyond. A transportation vehicle that brings cargo or people into outer space without itself entering an orbit does not have to be registered. Finally, parts of the national laws are related to liability issues, including—where so felt necessary by the legislator—a legal basis for the State to take recourse against the operator in case that State had to pay compensation according to Article VII of the OST for a damage caused by a space object.33 The implementation of an authorization mechanism in national jurisdictions is a fundamental element for the transparency of the regulation of space activities and ensures that international space law provisions are observed during all space activities. The enactment of such legislation further increases transparency as to the rights and duties of private actors conducting space activities.

Although the legislation described above consists mainly of the “building blocks” mentioned above, a number of differences exist and need to be highlighted. For instance, while all States regulate the transportation into as well as the transportation within outer space, only a few States have regulated the return from outer space to Earth.

Furthermore, the level of detail in the authorization requirements varies. Some States have a rather prescriptive system, while other rely more on general and high-level requirements and on a performance-based system. More experienced States draw the conditions for assessing mission safety in a much more detailed manner, mostly directly in the law. A number of States not only look at the specific transportation activity, but also take into consideration the safety performance of the applicant with the same or similar transportation vehicles. Consequently, the level of involvement of the authorizing authority may be limited where the applicant has proven a good management system and a good safety record in the past. In terms of specific authorization requirements, only few States have set forth an explicit requirement to minimize or even avoid the creation of space debris.

Following, while almost all States require the applicant to hold a third-party liability insurance, the conditions for and the amount to be insured vary immensely. In addition, some States make a clear connection to the requirements set forth for State indemnification. The combination of both may lead to totally different financial risks in case of third-party damage: while in some jurisdictions the holder of an authorization has almost no third-party liability risk (except to bear the insurance premiums), in another jurisdiction a holder may face the full liability risk directly from the damaged party as well as indirectly via the launching State. In other jurisdictions, the legislator has established a more balanced approach for sharing the third-party liability risk between the holder of the authorization and the (launching) State. This

32 Marboe/Hafner, supra note 9 at 60.
33 A more detailed description about the building blocks of such national laws can be found in: Gerhard, supra note 6 at 72–77, with references to many other publications describing or analyzing such legislation.
is maybe the most interesting parameter for the legislator when considering fostering its national space industry. Finally, due to national particularities in administrative law, some differences exist and need to be highlighted in terms of application and surveillance fees, duration of the authorization procedure.

With those closing remarks regarding space transportation, it is now necessary to turn to the regulation of spaceports.

**Spaceports**

A “spaceport” (also referred to as range, launch site or spaceport) can be regarded as the base from which spacecraft are launched. Following this, the term “spaceport” may refer to facilities involving devices for transportation to, from and via outer space.

While the building and operation of airports is heavily regulated in basically every national jurisdiction, the building and operation of spaceports is only regulated in a few States. Even States bearing spaceports on their territory do not necessarily provide for regulation and only regulate space transportation. However, a couple of States have established dedicated rules for the building and operation of spaceports.

**The United States**

In the US, the operation of spaceports, called launch and re-entry sites, is dealt with in 49 USC Chapter 701 as further implemented by 14 CFR Chapter III, §§ 400 et seq., Part 420 (launch sites) and Part 433 (re-entry sites). The main purposes of these regulations are the protection of public health and safety, safety of property, and national security and foreign policy interests of the US. To date, the competent authority (FAA/AST) has licensed eight commercial spaceport operations in the US.

Regarding the scope of application of the regulation, the operator of a launch site and the operator of a re-entry site need to hold a license. The regulation applies to anybody operating a site within the US, to US citizens and entities organized or existing under the laws of the US. Where the site is located outside US territory, the regulations can apply under certain circumstances to entities organized or existing under the laws of a foreign county, namely if a US citizen or entity holds the controlling interest in such entity operating a launch or re-entry site.

In order to be issued a license, the spaceport is subject to an environmental review, a location review (risk review), an explosive site review (handling and storage of propellants) and the demonstration of the ability of the operator to comply with his responsibilities, namely related to the public access to the launch site, to agreements with air traffic and coast guard and the scheduling of hazardous activities of its customers (i.e. launch operators, payload processors, etc.). Furthermore the operator has to demonstrate flight and ground safety. The operator of a re-entry site has to demonstrate that the designated location of re-entry can be wholly

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35 Status October 2014, see Office of Commercial Space Transportation, “About the Office” online: Federal Aviation Administration www.faa.gov/about/office_org/headquarters_offices/ast/about.
36 A “re-entry site” is defined as a location on Earth to which a re-entry vehicle is intended to return, whereas a re-entry vehicles means a vehicle designed to return from Earth orbit or outer space to Earth, or a reusable launch vehicle designed to return from Earth orbit or outer space to Earth, substantially intact.
37 Following the requirements of the National Environmental Policy ACT, 42 USC 4321, as further implemented by 40 CFR, parts 1500–1508.
contained and that the location is of sufficient size to contain landing impacts, including debris dispersion upon impact and any toxic release.38

**Australia**

In Australia, the operation of a launch facility is regulated by the 1998 Australian Space Activities Act.39 The license covers a particular launch facility, a particular kind of launch vehicle and particular flight paths.

The operator has to demonstrate his competence to operate the launch facility and launch vehicles of that kind, that all necessary environmental approvals under Australian law have been obtained, and that an adequate environmental plan has been made for the construction and operation of the launch facility. Furthermore, the operator has to demonstrate that he has sufficient funding to construct and operate the launch facility, that the probability of the construction and operation of the launch facility causing substantial harm to public health or public safety or causing substantial damage to property is as low as reasonably practicable, and that there are no concerns for Australia's national security, foreign policy or international obligations. The Act furthermore specifies standard conditions for the license, such as for example to provide information to the competent authority, as requested, and to allow the competent authority (i.e. the appointed Launch Safety Officer) reasonable access to the facility and to any space object at the facility.40

**France**

The French Act on Space Operations41 and the Decrees adopted for its application do not provide for a general regime for the operation of spaceports. Instead, the legislator only set certain conditions applicable for the exploitation of the Guiana Space Centre, especially through entrusting special missions to CNES and its President. Other common law provisions applicable to hazardous industrial activities and administrative law may also find application for ground range safety as the case may be. Labour Acts dedicated to workers’ occupational health and safety remain applicable, as well as pyrotechnics safety regulations. Environmental protection acts set forth to control the pollution and accidental hazards of installations involving dangerous substances and focus on protection of the environment and the public are also relevant. Finally, regulations set up to prevent major accidents for high-level industrial risk establishments may also play a role.42 These technical regulations and the specific regulations applicable to the Guiana Space Centre must be considered together for any launch activity

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39 Commonwealth Consolidated Acts, *supra* note 18. *The Space Activities Regulations 2001* provide further detail about the licensing regime, in particular material to be submitted with an application.

40 A summary of these requirements has been given e.g. by Michael E. Davis, “Space Launch Safety in Australia” in Joseph N. Pelton & Ram S. Jakhu, eds, *Space Safety Regulations and Standards* (Oxford: Elsevier, 2010) 95 at 95.


from the Guiana Space Centre. The French Act on Space Operations sets forth that any entity carrying out, under its responsibility and in an independent way, a space operation, has to obtain an authorization to do so. An operator of a spaceport is therefore also subject to this obligation and has to fulfill all general personal and technical requirements set forth in the law.\footnote{Since the requirements do not differ from those applicable to other space operators, it is referred to the description of the French legal framework applicable to space transportation above.}

In application of the French Act on Space Operations and its Decrees, the statutes of CNES have been modified and new prerogatives listed in the French Research Code.\footnote{See further considerations in Lazare, supra note 27 at 210.} CNES may exercise special police powers or administrative police in the name of the French government for the safe exploitation of the facilities of the Guiana Space Centre within the range perimeter. This perimeter includes the physical territory of the range and the vicinity up to the end of neutralization ground segment capability (close field flight safety area). CNES is therefore responsible for the enforcement of safety rules, a so-called “safeguard mission” consisting of control of the technical risks related to the preparation and performance of the launches from the Guiana Space Centre with the overall mission to ensure the safety of persons, goods and environment on Earth or during a launch. These rules apply to the transportation of the space object on site and tests and operations performed.

Further to this, CNES and its President are entrusted coercive powers in order to ensure safety of property and persons, which can take the form of evacuation of facilities, ceasing of activities or administrative fines.

Finally, under the authority of the government representative in the Département of Guiana, the President of CNES is entrusted with a coordination mission intending to ensure that all companies and other entities located and operating at the Guiana Space Centre abide by the applicable regulations. Regarding the safety mission at the Guiana Space Centre, the President of CNES shall set out applicable safety rules as regards the activities of designing, preparing, producing, storing and transporting space objects and their constitutive parts, as well as the tests and operations performed within the perimeter of the Guiana Space Centre. In particular, he shall aim at ensuring the overall coherence of the design requirements of ground facilities, roads and networks. He shall also define specific rules applicable on the ground and during the flight in order to ensure the protection of persons, property, public health and the environment. He shall also determine the areas to be protected during the launch phase and the limits of the flight corridor. He is furthermore responsible for checking the technical and meteorological conditions under which a launch can be carried out. Finally, he may adopt rules dealing with the destruction of the launcher in flight. The Space Centre Agreements concerning the operational management of the site remain in force and unchanged.

**Analysis**

So far, only a handful of States have enacted legislation specifically regulating the building and the operation of spaceports. Different from what has been said above about the purpose for regulating space transportation, the regulation of spaceports does not implement international space law requirements into national legislation. Those international treaties applicable to space activities do not address spaceports specifically. The regulatory purpose is therefore different and focuses mostly on domestic concerns. Still, the existing national legislations do present commonalities.
First, it must be noted that a fundamental element in all three jurisdictions described above is the protection of people and property on and around the spaceport, with regards the safety of its operation. The French regulation even explicitly mentions aspects of occupational health. Closely related and worth mentioning is the aspect of storing and handling of explosive material. Further, requirements related to the protection of the environment are set forth in all jurisdictions described. Finally, the technical and in some cases financial adequacy of the spaceport operator is checked by the licensing authority.

Second, in addition to this, isolated aspects only dealt with in some of these jurisdictions were highlighted, such as aspects related to the protection of national security and foreign policies, the control of access to the spaceport and the coordination with air traffic control.

The regulation of spaceports is still in its infancy, mostly because many spaceports are still being operated by States or with major shareholders thereof. It is expected that the growing participation of private spaceport operators in the space transportation field will lead to an enhanced need to regulate such activities. With States gaining more and more experience, further national dispositions regulating spaceports will evolve and mature, just as has been the case for the regulation of private space activities. Eventually, it may be expected that States will enter into international coordination of spaceport regulations.

Problems, gaps and future challenges

A challenge for the international and national space transportation regime is launches from the high seas or from the airspace above the high seas. The initial formation of the company Sea Launch and the launches performed from a platform on the high seas has shown that the international treaties bear uncertainties relating to the responsibility for such activities. This may result in unintended gaps regarding the compensation of damages caused by space objects launched from the high seas, in the case that none of the criteria for determining the launching State(s) can apply to the Contracting States of the OST and LIAB. Since national regulations reflect the international treaties, their application will not help to bridge that gap.

Quite often a gap also exists in the coordination between the launching States of a space object, especially when the space object is operated by a private organization and launched with a non-governmental launch service provider. Very often, at least two States qualify as launching States for one space object, for example because the launch is procured by the State of the private operator and the launch takes place from the territory of another State. In such constellations, only one of the launching States is entitled to register the space object in the international register and its national registry. The other launching State(s) is/are denied the right to do the same. The launching States therefore need to agree in which national registry the space object will be registered and which State registers it in the international register. Very often, launching States do not address the registration issue, so that the actual registration depends on whether and where the operator or the launch service provider (first) notifies the space object for registration. On many occasions, the space object is in the end registered in the State of its operator. However, in the case the State from whose territory the launch has taken place registers unilaterally all payloads in the international register without prior or further agreement with (the) other launching State(s), the space object cannot be registered anymore by the State of its operator. This may have severe consequences for the operation, considering the fact that the jurisdiction and control of the object remains with the launching State in whose registry the space object is registered.

A similar gap may also arise with regard to liability. All launching States are jointly liable for any damage that may be caused by the space object. If damage occurs, full compensation may
be claimed from one of the launching States. While this State can then request indemnification from the other launching States, an agreement must be found on the internal apportioning of the liability. Once damage has occurred, it is obvious that the subsequent definition of adequate apportioning may be challenging. It therefore may be recommendable to address the matter prior to the launch, taking into consideration the several phases of the space operation in which the damage can occur (e.g. during launch, separation, operation) and under whose actual control the space object will be during those phases (under the control of the launch service provider or under the sole control of the operator).

Considering these two gaps, amendment or supplementation may be considered of the international treaties requesting or recommending to launching States to enter – prior to the launch – into an agreement on registration and apportioning of liability. At the level of national regulations, States may consider making the issue of a license subject to an agreement (or the unsuccessful negotiation, as this cannot be a showstopper for the activity) with other launching States(s).

Another gap in many regulations relating to space transportation today is assessment of its consequences for aspects related to the environment. Only few national regulations include in their licensing requirements environmental considerations. Aspects such as noise and emissions of the transportation vehicle may come to the fore in the future.

The set of rules applicable to space transportation is still very basic, especially looking at the international regime. Some States have developed a more sophisticated legal regime, but many national regulations are limited to high-level requirements. With the increase of the number of space activities it can be expected that also the regulations applicable to space transportation will become larger. Accentuating for instance the aspect of safety of space transportation, existing standards will more and more be linked to the licensing requirements and new standards will have to be developed. While today, the licensing of space transportation predominantly focuses on the activity as such, future rules may bring into the picture the organizations involved in the activity beforehand. States may consider approving the manufacturer or the operator. The involvement of such approved (and controlled) organization will then become a fundamental cornerstone also for the safety licensing of the activity. In that context, the establishment and codification of concepts such as safety management systems can play an important role.

A future challenge for the rules applicable to space transportation will also be long-distance transportation. On the basis of the emerging activities of tourist space (or suborbital) flights, design organizations and operators intend to develop long-distance transportation. Such transportation will inevitably cross outer space in a parabolic flight. This activity is essentially different from the modes of space transportation presently carried out and described above. Specific new sets of rules may be developed, building on existing elements of air and space transportation regulation, enriched with new considerations. 45

A main challenge for spaceport regulation will be achieving an internationally harmonized set of rules. The international treaties and conventions related to the exploration and use of outer space have been developed in the late 1960s and 1970s at the beginning of the space age. They were laid down in a broad manner and have a limited scope. They do not apply to spaceports. Several spaceports exist around the globe and a new type of spaceports has emerged in the context of tourist space (or suborbital) flights. In the lack of a detailed and uniform international regulatory system, including technical standards, there is no guarantee of

45 For further consideration, see von der Dunk, supra note 4 at 200.
uniformity. There is a need to provide effective safety regulations as well as responsibility and liability mechanisms. Achieving international agreement on the design and operation of spaceports shows to be even more challenging than achieving such agreements for the exploration and use of outer space. Due to the immovability of spaceports and the fact that preoccupations linked to them are per se local rather than international, local considerations and existing partial regulations need to be taken into account. Harmonization through common European rules for aerodromes in Europe has shown this difficulty, despite the fact that national rules were established on the basis of agreed international standards.

A new challenge for spaceport regulations will also be the emerging activity of tourist space (or suborbital) flights. So far, spaceports predominantly provide the means for a vertical lift-off of rockets or other launch vehicles and are clearly separated from any conventional airport operation. With tourist space flights entering the market, the type of space transportation vehicle will change. Many operators plan to perform such activity with hybrid vehicles that will take off horizontally like any conventional aircraft. Spaceports from which such activities will take place will have different and additional aspects to regulate, which are much closer to those of a conventional airport, such as for example runway safety. Furthermore, operators of such tourist space flights or suborbital flights in the long run may want to take off from conventional airports, which will intermix requirements set forth for the takeoff (and landing) of aircraft and of such hybrid vehicles. This will for instance put more emphasis on regulations related to the protection of third parties (aircraft passengers) as well as the storage of explosive materials at the air/spaceport.

Conclusions

As a sine qua non requisite for the realization of space missions, space transportation is at the heart of the international and national regulation of space activities. The question of the operation of spaceports bears an equivalent relevance and becomes ever so important with the growing implication of private actors in the launching business. Several space-faring nations have enacted national space legislation on the common basis of the UN Treaties dedicated to outer space activities. Although most Acts solely focus on space operations, the regulation of spaceports does appear in the legislation of several States. Considering the launch phase is the moment where space activities bear the highest risk, it is understandable that States want to mitigate the risks and regulate the (private) activities, even though there is no international obligation to do so.

The international framework is common to all States that are party to the treaties, which explains the commonalities between their national regulations. The fact that this international framework makes the States responsible and liable for private space activities is reason enough for enacting national regulations. A number of gaps between those have been identified. Especially matters such as the regulation of launches from the high seas, the coordination between launching States, space traffic management or the safety of the operation of spaceports call for discussion and action.

It is now time to take space law a small step (“for a man”…) further.

46 A technical description of possible forms of lift-offs can be found in ibid at 199ff.