THE IMPACT OF LIABILITY RULES ON THE DEVELOPMENT OF PRIVATE COMMERCIAL HUMAN SPACEFLIGHT

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Private commercial human spaceflight, currently mainly in the form of space tourism, is one of the newest and most promising forms of human spaceflight. The liability rules that govern such flights play a decisive role, because, depending on their nature and structure, they can either promote or hamper the development of private human spaceflights. This paper focuses on the impact of the rules governing liability of spaceflight entities (SFEs), i.e. private entities involved in private commercial human spaceflight, towards spaceflight participants (SFPs), i.e. passengers of space vehicles. First, it is examined how liability affects the development of private commercial human spaceflight. Subsequently, it is analyzed how liability rules can be structured to promote the development of private commercial human spaceflight. It is concluded that liability rules are part of the cost, which influences private commercial spaceflight in various forms. They can contribute to the development of this activity, if there are concrete, special rules in force, which take into account its particularities and have been developed on the basis of clear policies. Such rules can be the exclusion of liability for ordinary negligence, the duty to inform SFPs on the risks of spaceflights and the establishment of core, performance-based safety standards.

In the last years, human spaceflight has changed its form from a purely governmental activity to a domain that increasingly involves the participation of private entities, which often develop their own spaceflight projects. Currently, private human spaceflight has the form of space tourism, which includes suborbital flights, orbital flights, flights to the space stations or private space stations or even flights to the Moon.[1] Nevertheless, scientific applications, like enabling experiments in weightlessness or microgravity are also envisaged. The liability rules that govern such flights play a decisive role, because depending on their nature and structure, they can either promote or hamper the development of private human spaceflights. In the following we will examine how the rules governing liability of spaceflight entities (SFEs), i.e. private entities involved in private commercial human spaceflight, such as operators of manned space vehicles and manufacturers of such vehicles, towards spaceflight participants (SFPs), i.e. passengers of space vehicles influence the development of private commercial human spaceflight. We will first examine the role of liability rules in the private human spaceflight. Subsequently, we will analyze how this role can be shaped to

promote the development of this activity.

I. HOW LIABILITY RULES AFFECT PRIVATE COMMERCIAL HUMAN SPACEFLIGHT

First of all, it has to be clarified that there is no unregulated activity. Liability rules embrace all possible human behavior. Even if an activity is not directly regulated by special rules, it is governed by the general rules on tortuous and contractual liability. Therefore, liability rules are always a factor to be considered.

Liability rules affect the development of private commercial human spaceflight by forming part of the operating risk and associated cost, and by creating incentives as to practical aspects of conducting spaceflights.

1) Liability rules as part of the risk/cost of private human spaceflight

Liability rules are strongly connected with the risk and the associated cost of conducting private commercial spaceflights.

For a business to be profitable and develop further, cost should be under control, so as not to exceed the financial resources available to the companies engaged therein, including expected yields over a certain period. Liability rules determine who should pay if something goes wrong and under what conditions. In other words, they allocate the cost incurred, should the activity not be conducted as safely as hoped and planned.

Private commercial human spaceflight is a kind of business activity, which is exercised with a certain cost to produce certain yields. Concerning the yields, these come mainly from the price paid by SFPs. As to the cost of the activity, because this business sector is a new one and involves cutting-edge technology, a considerable amount of cost is associated with research, development and testing of new technologies as well as improvement of the existing technologies. This is added to the ordinary cost of conducting business (labor, infrastructure, advertising, taxes etc.). Thus, the cost incurred by private SFEs is quite high.

Despite the high cost of their activity, the yields of SFEs can be higher than the cost, at least in the long-term. However, the liability risk could change the result of such cost-benefit analysis. If SFEs are obliged to pay too much money too often for compensating SFPs, then carrying on the activity may become unprofitable.

Thus, liability rules form part of the cost of private commercial human spaceflight.

2) Liability rules as incentives to the way a business activity is conducted

Because liability rules are part of the risk and the cost of a business activity, they influence the way this activity is exercised.

First of all, the liability rules in place may determine the place from which spaceflights will take place. If a State has liability rules that favor spaceflight entities, i.e. they reduce the cases in which SFEs have to compensate SFPs, then the liability risk will be lower. As a result, conducting spaceflights from the territory of this State will be more profitable.

Another measure to counterbalance high risk will be high prices for customers, so that the profits gained from the activity justify the risk taken. However, if the prices are set too high, then spaceflights may become

unattractive to potential SFPs.

In addition, SFEs might prefer to use existing technologies, which are tested and safer. Investing in research, development and testing of new technologies for future use could be discouraged, because the associated liability risk renders them too expensive. This could be valid even if new technologies are likely to be safer and more efficient in the long term.

Furthermore, liability rules influence the level of the activity, i.e. how often the activity will be carried out.[2] Increased liability risk would be offset by fewer flights for two reasons. The first reason is the need to conduct extensive safety checks before and after each flight, to ensure to the maximum extent possible that no mechanical or other failure will occur. The second reason is to reduce statistically the possibilities of having to carry the extra cost of compensation.

Thus, SFEs will organize their business activity in a way that reduces the risk and cost posed by liability rules.

3) Insurability

The form and structure of the applicable liability rules influence also their insurability.

Liability insurance is often used by companies to mitigate their operational risk and reduce the economic repercussions of an accident. For liability to be insurable, it has to be predictable, so that insurers can quantify the risk and calculate the appropriate insurance premiums, taking also into account the likelihood of an accident to happen. Therefore, the liability risk can be mitigated through insurance cover, if the applicable liability rules clearly define the circumstances under which it arises, the persons liable and the amount to be paid. Simpler expressed, liability rules need to define *who* has to pay *what* and *when*.

Consequently, clear liability rules facilitate the reduction of the liability risk through insurance.

4) The role of interpretation

It has also to be considered that legal rules affect an activity that they regulate not only by their wording, i.e. by what the rule provides as such, but also by their interpretation and application by courts. The same legal rule may be interpreted and applied differently in different cases, for two reasons: first the wording of the provision may be ambiguous and second courts strive to serve justice in the particular case before them.

Therefore, courts may take additional factors into account apart from the wording of the applicable provision. Such factors can be the policies behind the rule, which may be more than one and each time a certain policy is given priority, e.g. industrial development and environmental protection may be ranked differently. The notions of fairness and equity can also lead to different solutions, following a balance of interests of the particular parties involved, e.g. if the defendant in a lawsuit for damages is a large corporation, courts will probably treat the plaintiff differently if he/she is a middle-class worker that if it is a multinational company. Additionally, courts (especially supreme courts) often take into account the wider social and economic repercussions of their decision, e.g. adjudicating enormous punitive damages against a company involved in a certain industrial sector may cripple the whole sector,

because a wave of lawsuits could follow after the particular trial.

As a result, the interpretation and application of the liability rules are equally important as the liability rules themselves.

II. HOW LIABILITY RULES CAN PROMOTE THE DEVELOPMENT OF PRIVATE COMMERCIAL HUMAN SPACEFLIGHT

As a next step, we need to examine ways to use liability rules to promote the development of private commercial human spaceflight. This can be achieved, if special rules are in force. To this end, the particularities of the industry should be taken into account, in order to set clear policy aims, on whose bases concrete regulatory measures can be enacted.

1) Developing special rules

As we saw earlier, there is no unregulated activity. General liability rules will apply, if there are no special rules in force.

On the one hand, this is positive because it ensures accountability for all wrongful acts. On the other hand, however, general rules are vague and designed to apply to myriads of diverse cases. This allows their interpretation in various ways, which on the one hand creates legal insecurity and on the other hand increases litigation risk, because injured parties may try to benefit from this legal ambiguity.

On the contrary, special rules create to a great extent legal certainty. They are less equivocal and the policies behind them are clearer. Thus, they facilitate predictability as to the outcome of a trial as well as insurability of the SFEs' liability.

Moreover, the application of general rules risks leaving unconsidered the particularities of private commercial human spaceflights. As a result, the general liability rules may produce an undesirable outcome from a policy view. For example, the general rules on product liability may pose strict unlimited liability to manufacturers of suborbital vehicles in case of malfunction of a component. This would pave the way for extended and protracted litigation against them, which would incur significant cost and discourage experimentation with new technologies. Assumed that technological development in space transportation is a priority, the general liability rules would have an adverse effect.

Therefore, general rules on liability could hinder the development of private commercial human spaceflight. Special rules are needed. To this end, we have to (a) analyze the particularities of private commercial human spaceflight industry, (b) clearly define our policy aims and (c) establish concrete regulatory measures.

2) Particularities of the private commercial human spaceflight

The particularities of the private human spaceflight have many aspects. These regard the SFEs, the SFPs, the nature of private human spaceflights and the prospects of the industry.

As to the SFEs, the industry of private human spaceflights is a very new one. Essentially, the industry has started to develop since 2004.[3] The technologies used to reach outer space are diverse and include

various transportations systems with different configurations, e.g. single-stage and double-stage systems, hybrid vehicles and rocket-propelled vehicles, horizontal and vertical take-off and landing etc.[4] Nevertheless, all systems include to a smaller or greater extent innovative technological solutions to the technological challenges of spaceflight. At the same time, these technologies are largely untested and involve non-negligible risks of failure.

Because the cost of flying into outer space is quite high, respectively high is the price that SFPs have to pay. For example, the current cost of a 3-hour suborbital flight is about $ 200.000.[5] The cost of an orbital flight or a stay in a private space station is expected to be much higher.[6] This is further increased by the cost of training and medical examination. SFPs have to undergo special training, which lasts three days for a suborbital flight, to be able to respond to emergency situations and conduct special medical examination to ensure that they can handle the physical stresses of spaceflight, like gravity accelerations and decelerations, and weightlessness.[7] Therefore, SFPs will be mainly wealthy persons, able to afford to pay such large amounts of money.

In addition, private commercial human spaceflights are mostly recreational activities. They could be deemed as a kind of extreme sport.[8] In the alternative, they may serve scientific purposes, such as carrying out scientific experiments under conditions of microgravity or lack of gravity.[9] In any case, private commercial spaceflight is not an indispensable activity for ordinary people - there are not instances, in which ordinary people will be factually obliged to use them, as is the case with air travel for intercontinental journeys.

Furthermore, private human spaceflight can boost human space travel in general. New technologies can be developed that may revolutionize human access to space.[10] Suborbital space travel could be used for transportation between two Earth points and offer a much quicker alternative to air travel in the long run.[11] Inflatable orbital space stations can reduce the cost of staying in orbit. Private investment in near-Earth space could save a significant part of public funds for deep-space flights and exploration, such as robotic and manned missions to other celestial bodies of the solar systems, and construction of more powerful telescopes.[12] This is especially important in financial conjunctures like the present one, in which public spending for space activities is very limited, so that important space programs are in the verge of cancellation.[13] Thus, private human spaceflight can have wider social and economic advantages.

Finally, it has also to be considered that the financial repercussions of an accident for a SFE can be far greater than merely the compensation due to SFPs or to third parties on the surface of the Earth. First of all, an accident would hurt the reputation of the SFE as offering safe products and services, which would discourage potential customers from contracting with it.[14] This would affect its profitability prospects, which in turn would induce investors either to refrain from investing on the company or to withdraw their already invested capital. As a result, the financial risk of an accident is big.

The magnitude of such risk is amplified if we consider that the dangerous nature of

spaceflight coupled with its nascent stage of development are very likely to create a systemic dependency among SFEs. An accident sustained by one such entity could have a negative impact on all others, because the public and the investors may believe that private human spaceflight is too unsafe in general. In other words, a single accident in the early operating days of the industry could affect the whole industry by undermining trust in the feasibility of a relatively safe private human spaceflight. Reestablishing the trust of the public and the investors could require tremendous efforts. As a result, SFEs have a very strong incentive to self-regulate and conduct safely flights. [15]

Consequently, the private commercial human spaceflight industry is a nascent, fragile industry, whose growth entails significant advantages. At present, it has the form of a luxury activity.

3) Setting policy aims

As a second step, precise policy aims have to be set, which will take into account the above-mentioned particularities of private human spaceflights. Such aims could be (a) the development of the private commercial human spaceflight industry, because of the advantages it can entail; (b) the promotion of safety, it is a principle governing any human activity and; (c) the discouragement of irresponsible and reckless behavior of the parties involved, because people should not be exposed to preventable risks (d) the creation of a balance of interests between SFEs and SFPs, in which, however, the fragile condition of the industry and the luxury nature of private commercial space travel should be considered; and (e) the enhancement of legal certainty through unequivocal rules.

These policies are interconnected. Promoting safety is intertwined with discouraging irresponsible and reckless behavior, while the development of the industry does not mean that SFPs are not worthy of protection.[16] Besides, a balance of interests can only be established if there are clear rules in force.

Nevertheless, not all objectives can be achieved completely at the same time. Excessive legal certainty could prevent judges from striking a balance of interests in the individual case. The notion of "irresponsible and reckless" behavior can only be specified under consideration of the special facts of each case. Safety is paramount, yet focusing too much on safety by setting standards unrealistic for the state of the industry could hinder the development of the industry.

Therefore, the regulatory measures to be established based on such policies should strike a delicate balance among them, so that the implementation of one policy does not frustrate the implementation of another.

4) Possible regulatory measures

Finally, we should establish concrete liability measures to implement our policy objectives.

a. Limitations and exclusions of liability

Limitation or exclusions of liability of the SFEs towards SFPs would be a good start. Limitation can be achieved through liability caps, which limit the total amount of compensation to be paid. Exclusions of

liability preclude completely compensation for certain cases. The advantage of liability limitations and exclusions is that they reduce the liability risk, make it more predictable and easier insurable.

Liability caps are widely used in transport contracts and in international transport conventions.[17] Their most usual forms concerning passenger liability is that they limit the amount to be paid by carriers if the accident is due to ordinary negligence, but they are inapplicable to cases of recklessness, gross negligence and intent. Absolute liability caps are combined with strict liability and are used mainly to regulate third-party liability; therefore, they are not appropriate to regulate the liability of SFEs towards SFPs.

Liability exclusions bar recovery for ordinary negligence. They are often used as clauses in contracts for extreme sports. As with liability caps, they are inapplicable to cases of recklessness, gross negligence and intent. Consequently, liability exclusions are practically an enhanced form of limitation.

For the current stage of development of the industry, liability exclusions for ordinary negligence are the most preferable solution. Given that the technology used in private human spaceflights is largely untested and the hazards of flying into outer space are very high, ordinary negligence would be easy for a plaintiff to establish. However, this could cause a wave of lawsuits, which would cripple the young industry, even if we assumed that liability for ordinary negligence was limited. Therefore, liability exclusions for ordinary negligence would shield the industry to a considerable extent against compensation claims of SFPs. Such exclusions are already in force in Virginia[18] Florida[19] New Mexico[20] and Texas[21].

It has also been suggested that in the early days of the industry liability should be excluded for all cases of negligence.[22] On the one hand, this would reduce claims against SFEs, because in practice the limits of ordinary negligence and gross negligence are often unclear, which may create a promising challenge for plaintiffs' lawyers. Moreover, SFEs have a strong incentive to self-regulate safety, as a single accident could lead them to bankruptcy. On the other hand, excluding liability for negligence in general creates the risk of irresponsible behavior and could compromise safety. Despite the danger of going out of business, few successful initial flights combined with the urge to remain competitive might lead SFEs to overoptimism and underestimation of the risks of spaceflights. In addition, excluding liability for all cases of negligence distorts the balance of interests between SFEs and SFPs, a fact underlined by the absence of other domains in which gross negligent behavior is allowed.

Consequently, establishing exclusions of liability for ordinary negligence can protect the industry from excessive claims without unduly infringing the interests of SFPs and jeopardizing safety.

b. Duty to inform on the risks

If liability for ordinary negligence is to be excluded, then SFPs, who participate in an ultra-hazardous activity, should be informed extensively on the risks they undertake. Otherwise, there is the danger of fraud and misrepresentation, which could affect the interests of both the SFPs, who might be taken advantage of, and SFEs, which would risk extensive litigation.

Information provided to SFPs should be clear, detailed and comprehensible by an average person. SFPs should be made fully aware that by flying privately into space entails very high health risks and even death, so that they are in position to weigh the pros and cons of private human spaceflight and make a reasonable and responsible decision.

Extensive information benefits not only SFPs, but also SFEs. SFEs they can use the consent of SFPs to fly despite the dangers as an assumption of risk, which will bar recovery for SFPs in case of an accident due to ordinary negligence.[23] In other words, the informed consent of SFPs serves as an exclusion of liability.

US Congress and the Federal Aviation Administration of the US (FAA) have already laid down rules that oblige SFEs to provide extensive information before signing any contract with interested customers.[24] These requirements have also been implemented by the US states that have regulated liability issues of SFEs.[25]

c. Minimum safety standards

Another measure strongly connected with liability is the establishment of technical minimum safety standards.

Safety standards could facilitate the judgment on the existence of gross negligence. Conformity with the standards would create a strong case for non gross negligent behavior, whereas failure to comply with the safety standards would probably trigger liability. Compliance with mandatory safety standards is already used as a criterion of (non) negligent behavior in aviation, especially in product liability cases.[26]

Safety standards could be laid down through cooperation of the competent State authorities (e.g. space agencies and civil aviation authorities) with the industry, so that the particularities of the activity in question (suborbital flight, orbital flight, orbital stay etc.) as well as of the technical concepts used by SFEs are taken into account. The standards could have the form of either certification requirements (at the example of aviation) or licensing conditions (at the example of launches of space objects). However, non-binding technical recommendations are unlikely to play an essential role in liability issues, because they might be deemed as having limited importance to the safety of the flight.

Safety standards should not be too detailed, given the lack of experience in private human spaceflight. Furthermore extensive safety standards might increase unnecessarily the cost of spaceflights, because of the expenses needed for compliance and could even hamper innovation. Therefore, it would be preferable that core performance-based requirements are laid down, to allow flexibility and keep cost to reasonable levels. In the US, the FAA has already established few such requirements for licensing of launch and reentry vehicles[27] and is considering laying down more in cooperation with the industry[28].

As a result, laying down obligatory minimum safety standards can increase safety and benefit all parties involved.

d. Insurance requirements

An additional measure might be laying down minimum insurance requirements, which could apply to either the SFEs or the SFPs.

Insurance requirements for SFEs would have the form of passenger-liability insurance at the example of aviation. If liability for ordinary negligence is excluded, then passenger-liability insurance could only cover cases of gross negligence. Such insurance is already available in the context of aviation, yet it is expected to be very expensive. Thus, to prescribe obligatory passenger-liability insurance for SFE would incur significant cost on them.

In the alternative, obligatory personal accident insurance for SFPs could be laid down. Such insurance would resemble the personal accident insurance for extreme sports. The exact insurance amount could be agreed upon contractually, based on the financial and medical condition of each SFP. Personal accident insurance could save an important amount of time and money in the dispute resolution process, should an accident occur. The relatives of the SFP would choose to present a claim against SFEs only if the anticipated amount of compensation was higher than the amount received by their insurer plus the cost of the time and the legal expenses that a trial would require. Hence, obligatory personal-accident insurance for SFPs provides advantages.

On the other hand, personal accident insurance would be quite expensive in the early days of private commercial spaceflights. The largely untested technology entails a respective risk of an accident. Besides, the high price of the tickets means that SFPs could be only wealthy customers. As a result, there will be considerable chances for insurance companies to pay a considerable compensation, which means that the insurance fees will be considerably high.[29] This would increase the total cost of flying for SPFs and could make them unattractive.

Consequently, insurance issues should be best left to the contractual parties to decide upon a cost-benefit analysis.

CONCLUSION

In conclusion, liability rules play a key role in the development of private commercial human spaceflight. They affect it by forming part of the risk of the activity and the associated cost, by influencing practical aspects of the activity, such as the place of the operations, the price of the flights, their frequency and the technologies used and by determining significant aspects of the insurability of the activity. Apart from the form and structure of the applicable liability rules, the interpretation of the liability rules by courts is an addition factor to be considered.

Liability rules can promote the development of the industry if there are special rules in force, which take into account the particularities of private commercial human spaceflight and have been established on the basis of clear policies, such as the development of the industry, the promotion of safety, the discouragement of irresponsible and reckless behavior, the creation of a balance of interests between SFEs and SFPs and the enhancement of legal certainty. Appropriate measures, for the current status of private human spaceflight, would be the exclusion of the liability of SFEs towards SFPs for ordinary negligence, the duty of SFEs to inform SFPs on the risks of spaceflights and the establishment of minimum, performance-based safety standards. Insurance issues should be let upon

parties to agree.

Given that at present private commercial human spaceflights are not going to have the form of an international space travel, liability rules could be developed first at national level. If there the future advancement of technology creates the need of an international regulation, then an international instrument, such as an international convention or a model law could be developed; however, at present an international initiative would be premature. In addition, the industry has a very strong incentive to self-regulate owing to the wide repercussions of an accident. As a result, it would be preferable to use complementarily formal regulation with self-regulation to avoid unnecessary cost.

[1] See an overview of space tourism forms at http://www.spacetourismnow.com/ (last visited on 13 Sept. 2011).
[2] On the influence of liability rules on the level of activity see *Shavell, Steven*, Foundations of economic analysis of law, Cambridge 2004, p. 193 et seq.
[3] This is the year when when the X PRIZE Foundation awarded the $10 million Ansari X PRIZE, to Scaled Composites for its craft SpaceShipOne, which was the first to build and launch a spacecraft capable of carrying three people to 100 kilometers above the earth's surface, twice within two weeks. See details at http://space.xprize.org/ansari-x-prize (last visited on 30 Aug 2011).
[4] See for example the report of *FAA/AST*, 2011 U.S. Commercial Space Transportation Developments and Concepts: Vehicles, Technologies, and Spaceports, available at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/111355.pdf (last visited on 5 Sept. 2011).
[5] http://www.virgingalactic.com/booking/ (last visited on 5 Sept. 2011).
[6] Recently it was announced that space tourism flights to Russian space stations will cost $ 800.000 for a five-day trip including transfer with a Soyuz capsule - http://rt.com/news/russia-space-hotel-price/ (last visited on 13 Sept. 2011).
[7] See on the health risks of spaceflight *Wichman, Harvey A.,* Behavioral and Health Implications of Civilian Spaceflight, Aviat. Space and Environ. Med. 2005, B164 (B165); *McDonald, Vernon P./ Vanderploeg James M. et al*., AST Commercial Human Space Flight Participant Biomedical Data Collection Wyle Laboratories, Inc., Technical Report #LS-09-2006-001, (1 February 2007), p. 18, available at: http://www.spacemedicineassociates.com/userfiles/file/ast_FAA_report.pdf (last visited on 13 Sept. 2011).
[8] Compare for example http://xtremesport4u.wordpress.com/tag/sub-orbital-flights/ (last visited on 13 Sept. 2011).
[9] See http://www.wired.com/wiredscience/2011/02/suborbital-spaceflight-research/ (last visited on 13 Sept. 2011).
[10] Compare the findings of US Congress at 51 USC Sec. 50901.
[11] See *Adebola, Simon/Antinaef, James et al*., Great Expectations: An Assessment of the Potential for Suborbital Transportation, Final Report, Masters Program of the International Space University, Strasbourg, 2008, p. 1; DOT Report on PTP commercial space transportation in the NAS (10 March 2010), at http://www.faa.gov/about/office_org/headquarters_offices/ast/media/point_to_point.pdf (last visited on 5 Sept. 2011); *Coppinger, Bob*, Virgin Galactic and NASA to research hypersonic point to point travel, available at: http://www.flightglobal.com/articles/2007/02/21/212266/virgin-galactic-and-nasa-to-research-hypersonic-point-to-point.html, posted on 21 Febr 07 (last visited on 13 Sept. 2011).
[12] Compare the NASA plans to use private vehicles to carry cargo and persons to near-Earth orbit – see http://www.nasa.gov/offices/c3po/home/index.html (last visited on 13 Sept. 2011).
[13] See for example the case of the James Webb space telescope at http://www.space.com/12187-nasa-budget-bill-cancels-space-telescope-house.html (last visited on 13 Sept. 2011).
[14] *Malfitano, David*, Space tourism: The final frontier of law, 33 Rutgers Computer & Tech. L.J. (2009), 203, 212.
[15] See more in this regard in *Yates, Rachel A*., Informal regulation of space activities, 87 Nebr.L.Rev.

(2008), 530, 533.
[16] *Malfitano*, supra note 14, at 223.
[17] E.g. International Convention for the unification of certain rules relating to international carriage by air, signed at Warsaw on 12 October 1929; the Convention concerning International Carriage by Rail, signed at Berne on 9 May 1980; the Convention relating to the Carriage of Passengers and their Luggage by Sea, signed at Athens on 13 December 1974.
[18] Va Code §8.01-227.8, 227.9, 227.10.
[19] Fla. St. §331.501.
[20] SB 009 / 2011, Space Flight Informed Consent Act.
[21] Title 4, Chapter 100A Texas Civil Practice and Remedies Code.
[22] *Malfitano*, supra note 14, at 214.
[23] On the assumption of risk as a bar for recovery see *Carrel v. Allied Products Corp*., 78 Ohio St. 3d 284, 677 N.E.2d 795 (1997); *Cunningham ex rel. Grice v. Helping Hands, Inc*., 352 S.C. 485, 575 S.E.2d 549 (2003); *Nelson v. Great Eastern Resort Management, Inc*., 265 Va. 98, 574 S.E.2d 277 (2003); *Clayton v. Travis*, 109 F.3d 669 (11th Cir. 1997). The defence does not apply to cases of wilful or wanton conduct and gross negligence - *City of Winder v. Girone*, 265 Ga. 723, 462 S.E.2d 704 (1995); *Perez v. McConkey*, 872 S.W.2d 897 (Tenn. 1994).
[24] 49 USC § 70101(5)(d); 14 CFR 460.45(a).
[25] Currently, such rules are in force in Virginia, Florida, New Mexico and Texas – see supra notes 17-20 respectively.
[26] *Kreindler, Lee S*. Aviation Accident Law, 2006, New York 2006, § 5.02 [6][b].
[27] 14 CFR § 460.11- §460.17.
[28] See the presentation of *Jim Van Laak*, FAA Approach to Human Space Flight Regulations For Occupant Safety on Orbital Missions (26 May 2011), available at http://www.faa.gov/about/office_org/headquarters_offices/ast/ (last visited on 13 Sept. 2011).
[29] See *Gimblett, Richard*, Space Insurance into the Next Millennium, in *Lafferanderie, Gabriel / Crowther, Daphné* (eds), Outlook on space law over the next 30 years, The Hague et al. 1997, p. 163 (168) who estimates that the elevated socio-economic profile of the early space tourists would entail high liability exposure.