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Informal Regulation of Space Activities

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I. INTRODUCTION

The most studied and academically debated laws regarding outer space consist of the five United Nations treaties, which were entered into force from 1967 to 1984. After this condensed period of treaty activity, United Nations resolutions and principles took the place of treaties on which consensus otherwise needed to be achieved. Hard space law developed primarily at the national level in the form of various acts or regulations adopted by individual nation states. Even though formal laws can typically be promulgated more quickly at the national level, such hard laws still may not be the most efficient method for governmental legal oversight. Formulation of laws can no longer keep pace with the technological innovations that drive the aerospace industry. Often informal laws, through industry self-regulation or contract, prove more effective in protecting the rights of those engaged in such activities and public safety. The informal regulation of space activities will likely supplant the role that formal laws once held except where targeted, formal laws are needed to fill gaps left through informal regulation.

In the United States, one example of a blend of informal and formal law is the regulation of the nascent space tourism industry. Until the design and engineering of launch, orbital, and reentry vehicles are validated, formal regulation of the industry must be flexible, liberal, and practical. The United States Federal Aviation Administration ("FAA") has recently followed this approach in the promulgation of

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regulations on human space flight. After weighing several competing interests and policies to avoid artificial or rigid barriers that might stifle innovation unnecessarily, the regulations intentionally impose the least restrictive requirements that encourage safety. The development of the regulations reflects a model for cooperation between the industry and its regulating agency. In response, the industry has begun regulating itself and, where needed, seeking formal laws to supplement its self-regulation.

In 1995, the Commercial Space Launch Activities Act ("CSLA") comprehensively legislated launch and reentry activities.[1] By delegation, it authorized the FAA to regulate launches, reentries, and the operation of sites.[2] Until 2004, the FAA had licensed only operators of expendable launch vehicles, but in that year, it issued two reusable launch vehicle ("RLV") licenses for missions involving an on-board pilot. Congress thereafter adopted amendments to the CSLA to address human space transportation for hire, mandating that the FAA promulgate regulations for human space flight.[3] The FAA issued a formal Notice of Proposed Rulemaking for human space flight requirements, setting out proposed regulations to address these areas.[4] The final rule was issued on December 15, 2006.[5] Simultaneously, the FAA received comments on its proposed regulations for experimental permits for reusable suborbital launch vehicles, which were finalized on April 6, 2007.[6]

Both the U.S. statute and the administrative regulations admirably balance protection of the affected public and government controls. Although such provisions constitute law promulgated through formal legislation and rulemaking, they rely heavily on a component of self-regulation by the industry.

II. DESIGN AND OPERATIONS

For instance, the regulations impose general safety requirements for human space flight, but nonetheless give companies substantial flexibility in the design and operation of spacecraft, subject only to narrow requirements for protection of crews and space flight partici-

1. 49 U.S.C. §§ 70101–70121 (2000).
2. *See id.* §§ 322(a), 70101–70121.
3. Commercial Space Launch Amendments Act of 2004 ("CSLAA"), 49 U.S.C. §§ 70101-70120 (Supp. V 2005).
4. Human Space Flight Requirements for Crew and Space Flight Participants, 70 Fed. Reg. 77262 (proposed Dec. 29, 2005) (to be codified at 14 C.F.R. pts. 401, 415, 431, 435, 440, 450, 460) (notice of proposed rulemaking).
5. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. 75616 (Dec. 15, 2006) (to be codified at 14 C.F.R. pts. 401, 415, 431, 435, 440, 460).
6. Experimental Permits for Reusable Suborbital Rockets, 72 Fed. Reg. 17001 (Apr. 6, 2007) (to be codified at 14 C.F.R. pts. 401, 404–06, 413, 415, 420, 431, 437).

pants. Until 2012, the FAA may only restrict or prohibit design features that have resulted in serious or fatal injuries to crews or space flight participants during a licensed or commercial human space flight or contributed to an unplanned event that posed a high risk of causing serious or fatal injuries.[7] As the FAA stated in its comments on the final rule, "For the next six years, the FAA has to wait for harm to occur or almost occur before it can improve restrictions."[8]

The regulations also balance competing interests between governmental requirements and industry standards by imposing only limited controls on cabin conditions, including environmental and life support systems, smoke detection, fire suppression, and security.[9] The operator may choose the best method for achieving general safety requirements by employing active or passive systems, on board or remote operations, or open-loop or closed-loop systems.[10] To obtain an experimental permit, the spacecraft engineer may validate the technology quickly, without all the hurdles otherwise required for a license.[11]

Despite the hands-off approach of formal government regulation, the industry is under intense, external pressure to create safe and reliable designs. Before an operator can obtain a launch license, it must provide minimum levels of insurance.[12] Both insurers and operators recognize the tremendous costs to insure an activity based on untested or unproven technologies or applications, particularly when that activity may result in human fatalities (of crews, participants, or the public) in the event of a failure. By some accounts, insurance policy costs will continue to be extremely high until operators establish a track record of safety by flying at least three times without mishap, with a total of ten to fifteen launches across the industry.[13] Failure by one company is likely to increase insurance costs across the board, spurring the industry's interest in ensuring the safe activities of even its competitors.

To the same effect, regulations mandate that an operator make disclosure to the space flight participant of the known hazards and risks that could result in a serious injury, death, disability, or total partial loss of physical or mental function; the fact that participation

7. 49 U.S.C. § 70105(c) (2000 & Supp. V 2005).
8. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. at 75624.
9. 14 C.F.R. §§ 460.11, 460.13, 460.53 (2008).
10. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. at 75622.
11. 14 C.F.R. §§ 437.5, 437.7, 437.9, 437.11, 437.13, 437.21; Experimental Permits for Reusable Suborbital Rockets, 72 Fed. Reg. at 17002 ("A permit provides an alternative to licensing for operators of reusable suborbital rockets.").
12. 14 C.F.R. § 440.9 (2008).
13. Colin Clark, "Space Tourism Insurance to Be Expensive," SPACE NEWS, Feb. 11, 2008.

may result in a serious injury, death, disability, or total partial loss of physical or mental function; and the safety record of all crewed vehicles.[14] In turn, the safety record must include statistics about death or injury to people on the flights, the number of catastrophic failures, the number of vehicle flights, the number of safety-related anomalies or failure, and any corrective actions taken to resolve them.[15] The safety record is not limited to the vehicle on which the space flight participant will be traveling but *all* crewed space vehicles developed by any company.[16] The FAA is considering developing a database on the safety record for both government and private sector transport to aid in this disclosure but not to excuse the obligation of the operator to provide such information on its own.[17]

Mandating disclosure of the industry's safety record creates an incentive for self-regulation among the elite group of companies that have developed, or are developing, spacecraft. Failures by any company threaten the safety record of all, make space flight appear too perilous, and risk the imposition of heavy-handed government regulation. Peer pressure, coupled with economic necessity, will likely prove a stronger motivator than formal government regulation.

III. SPACE FLIGHT PARTICIPANTS

As it pertains to space flight participants, the statute limited the FAA's control almost exclusively to regulating the disclosure of information.[18] As noted above, under the CSLAA, to obtain a license or permit, the operator must certify that it has informed the space flight participants of the risks of launch and reentry, including the safety record of the vehicle type; that the U.S. government has not certified the launch vehicle as safe for carrying humans; that the space flight participant has provided written, informed consent to participate; and that the operator has complied with FAA regulations.[19]

In the resulting regulations, the FAA balanced competing views of the role of government to protect space flight participants. Weighing in favor of personal responsibility, the regulations require that space flight participants be trained to respond to emergency situations and

14. 14 C.F.R. § 460.45 (2008).
15. *Id.* § 460.45(c)–(d).
16. *Id.* § 460.45(c).
17. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. 75616, 75625 (Dec. 15, 2006) (to be codified at 14 C.F.R. pts. 401, 415, 431, 435, 440, 460).
18. 49 U.S.C. § 70105 (2000 & Supp. V 2005); Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed. Reg. at 75624 ("Instead [of restricting design features and operating practices,] Congress requires that space flight participants be informed of the risks.").
19. 49 U.S.C. § 70105(b)(5) (2000 & Supp. V 2005).

to avoid jeopardizing the safety of flight crews or the public.[20] However, riders need not take any medical examinations and will not be required by law to receive the same training as crews.[21]

In the comment phase of these regulations, some parties strongly advocated that the role of the government included protecting the participants from their own, unwise decisions. The FAA assumed, however, that a spaceflight participant would choose to consult with his or her own physician before embarking on such an adventure, and this assumed self-interest in personal safety overrode the motivation for formal government regulation. Similarly, the space flight participant could be expected to make informed decisions about risks of design or operational failures either with the help of chosen professionals or independently, but without the need for direct government intervention.

Even if the space flight participant acts differently than expected, this regulatory scheme has in practice encouraged self-regulation by the operators. Both Virgin Galactic and XCOR Aerospace, the two leading personal space flight companies, require contractual medical clearances from all participants. In addition, the companies insist that participants undergo flight training to a greater degree than is otherwise required by regulation. Again, economic necessity, driven by possible adverse public reaction to a negative participant experience or by risk of liability lawsuits, will prompt a greater degree of targeted self-regulation than a comprehensive regulatory scheme.

Despite the strong incentives for companies to operate safely, the federal regulations do require space flight participants to sign a waiver and an informed consent acknowledging that the participants understand the risks and that their presence on board the vehicle is voluntary.[22] The waiver required in the final rule protects only the government, not the operator, ensuring that the operator is not relieved statutorily of its duties of care toward space flight participants.[23]

This is one area in which the regulations do not create the strongest motivation for self-regulation. For protection of operators, informal methods must fill the statutory gap in the law's liability protections. Rather than assume the potential liability for an operational failure and work to avoid it, operators take a practical approach of requiring each space flight participant to execute a separate contractual waiver and release to accompany any informed consent. Under some state laws, waivers are contrary to public policy for the

20. 14 C.F.R. §§ 460.51, 460.53.
21. Human Space Flight Requirements for Crew and Space Flight Participants, 71 Fed Reg. at 75626 ("The FAA is not requiring that a space flight participant obtain a physical examination."); 14 C.F.R. §§ 460.51, 460.53.
22. 14 C.F.R. § 460.45(f).
23. *Id.* § 460.49.

very reason that waivers create disincentives for companies to operate safely.[24] An enforceable contractual waiver will need a choice of law provision so that the waiver is not inadvertently nullified by a state law. What the regulations leave open, the parties will make firm by way of contract, albeit contracts that will be tested under a state common law scheme.

IV. CREW TRAINING

The regulations require licensees to adequately train crews so as not to create additional perils.[25] Although this general requirement exists in the law, operators have flexibility to determine the best training methods. Crew training devices must "realistically represent[ ] the vehicle's configuration and mission" or the operator must advise crew members of the differences.[26] The training must be updated to reflect lessons learned and to ensure that crew qualifications are current.[27] Rather than apply a one-size-fits-all approach to training, however, the FAA believes that it can more appropriately account for the diversity in vehicles by adding terms and conditions specific to the vehicle in the license or permit.[28] While this creates initial uncertainty about the regulatory process, it appears to be the only practical means for achieving the goal of encouraging adequate training of crew members.

Here again, private industry fills the gap left by generalized regulation. Training facilities have developed to meet this need.

V. INDUSTRY ASSOCIATION

The Personal Space Flight Federation is an industry association formed to provide a cohesive voice to this developing industry. The mission of the federation is to "promote the development of commercial human spaceflight, pursue ever higher levels of safety, and share best practices and expertise throughout the industry."[29] The group resolved at its formation in 2005 to develop a Voluntary Personal Spaceflight Industry Consensus Standards Organization to develop

24. Louisiana, Montana, and Virginia have not enforced such contractual waivers. John Sadler, *Are Waiver/Releases Worth the Paper They Are Written On?*, http://www.sadlersports.com/riskmanagement/sports-insurance-waiverrelease.html (last visited July 25, 2008).
25. 14 C.F.R. §§ 460.5, 460.7.
26. *Id.* § 460.7.
27. *Id.*
28. Human Space Flight Requirements for Crew and Space Flight Participants, 70 Fed. Reg. 77262, 77265 (proposed Dec. 29, 2005) (to be codified at C.F.R. pts. 401, 415, 431, 435, 440, 450, 460).
29. Personal Spaceflight Federation, http://www.personalspaceflight.org/ (last visited July 25, 2008).

standards for implementing the CSLAA.[30] While working toward development of such standards, the group intends to distribute best practices for safety in spaceport operations, crew and participant training, and vehicle manufacture, operations, and maintenance.[31]

It also identified as an early goal the need to develop stronger state laws for liability protection. Among other activities, it has drafted and promoted a model state law for the governance of personal space flight. The model law was adopted in Virginia first, effective July 2007.[32] It provides that if the federally-required disclosures and warning are given, the space flight participant's written acknowledgement and waiver will create immunity for the space flight operator.[33] No lawsuit may be maintained against the operator unless the damage resulted from willful and wanton, or intentional, conduct.[34] Virginia has been competing as the Mid-Atlantic Regional Space Port to serve as a spaceport for this nascent industry.

Florida was next to follow suit. Florida Statutes § 331.501 was created to provide limited protection to spaceflight entities.[35] Qualified spaceflight entities must hold an FAA license and meet the state statutory requirements for warning spaceflight participants.[36] Then, the entity will not be liable for injury or death to a participant resulting from the inherent risks of spaceflight activities.[37] However, the entity's protection is limited. Liability exists if the entity was negligent or acted willfully or wantonly; had actual or constructive knowledge of a dangerous condition that proximately caused the injury, damage, or death; or intentionally injured the participant.[38] The breadth of these exceptions threatens to nullify the protections otherwise afforded spaceflight entities.

These state laws provide evidence of the balance between formal and informal laws. The federal regulations took a sufficiently hands-

30. Press Release, Personal Spaceflight Federation, Space Entrepreneurs Resolve to Create Industry Group to Promote Safety Standards and Growth of the Personal Spaceflight Industry (Feb. 8, 2005), *available at* http://www.personalspaceflight.org/ (follow "Press Releases" hyperlink; then follow "Personal Spaceflight Federation, Space Entrepreneurs Resolve to Create Industry Group to Promote Safety Standards and Growth of the Personal Spaceflight Industry" hyperlink).

31. Press Release, Personal Spaceflight Federation, Personal Spaceflight Federation Announces Future Plans (Aug. 22, 2006), *available at* http://www.personalspaceflight.org/ (follow "Press Releases" hyperlink; then follow "Personal Spaceflight Federation Announces Future Plans" hyperlink).

32. Space Flight & Immunity Act, H.D. 3184, 2007 Gen. Assem., Reg. Sess. (Va. 2007).

33. *Id.*

34. *Id.*

35. H.R. 737, 2008 Reg. Sess. (Fla. 2008).

36. FLA. STAT. ANN. § 331.501(1)(c), (2) (West 2008) (effective Oct. 1, 2008).

37. *Id.* § 331.501(2).

38. *Id.* § 331.501(2)(b).

off approach to allow the development of an industry association whose purpose includes the creation of consensus industry standards. In turn, the industry federation identified areas needing specific legislation and drafted model laws for adoption by state legislatures. This partnership among lawmakers and stakeholders has the best chance of promoting a new industry while ensuring safety of those involved in an effective manner.

VI. CONCLUSION

Formal laws may not be able to regulate developing space activities with sufficient speed and flexibility to ensure the viability of the industry. The CSLAA and implementing regulations defer formal regulation until such time as the personal flight technologies and practices have become more refined through trial and error. Meanwhile, the industry is left to regulate itself, and it has begun to do so through private contracts and the development of best practices and standards. Where self-regulation is inadequate, the industry has sought the enactment of hard law to fill perceived legal gaps. Because strong incentives exist for careful self-regulation, the government's hands-off approach is likely to be effective in the personal space flight industry.