SPACE TOURISM: THE FINAL FRONTIER OF LAW

I. INTRODUCTION

Ever since that fateful autumn day in 1957 when the Soviet Union surprised the world by launching Sputnik I, humankind has been fascinated with what lies above.[1] In little over a decade, that fascination was further ignited when man first walked on the surface of the moon.[2] By the summer of 1969, it seemed only a matter of time before anyone and everyone would be able to reach the heavens. Unfortunately, it would be over forty years before the opportunity to reach the stars would once again be within the reach of the common individual.[3]

It took another fateful autumn day, some forty-seven years later, for the dream of so many to gain national exposure once again.[4] On October 4, 2004, Burt Rutan and his financier Paul Allen, were awarded the $10 million Ansari X PRIZE for successfully designing and testing a spacecraft capable of carrying three people more than 50 miles above the planet's surface twice in two weeks.[5]

1. *See* Sputnik and the Dawn of the Space Age, http://history.nasa.gov/sputnik/ (last visited May. 10, 2009).

2. *See* The Apollo Missions, http://www.nasa.gov/mission_pages/apollo/index.html (last visited May 10, 2009).

3. The last Apollo mission was in 1972. *See generally* NASA Apollo Mission, *Apollo* 17, Mission Highlights, http://science.ksc.nasa.gov/history/apollo/apollo-17/apollo-17.html (last visited May 9, 2009). For years before this, NASA's budget had been declining due to the perception that the space race was over. *See Putting NASA's Budget in Perspective*, http://richardb.us/nasa.html (last visited May 9, 2009). As a result, the Space Shuttle was designed to fly only in low Earth orbit. Space Shuttle and International Space Station, Frequently Asked Questions, http://www.nasa.gov/centers/kennedy/about/information/shuttle_faq.html#15 (last visited May 9, 2009). Only recently has it again become plausible that regular citizens could fly into space.

4. *See* Ansari X PRIZE, http://space.xprize.org/ansari-x-prize (last visited May 9, 2009) (describing the Ansari X PRIZE competition).

5. *Id.*

Mr. Rutan's success captured the nation's imagination, but at the same time, gave rise to a host of legal questions.

Many of the major legal problems associated with the burgeoning space industry have been addressed, such as the appropriate jurisdiction for legal matters and what conduct is permitted in space.[6] However, many specific questions remain unanswered, such as how private space faring companies will be regulated, and who will be liable for any problems or accidents (i.e. the state, or the commercial space company). Additionally, the extent of personal liability for those operating spacecrafts remains in question. Are the operators to assume the risk of an obvious and inherently dangerous undertaking? Furthermore, once liability is established against either the customer or the company, how should we apportion it? These are some questions that have been posed by the birth of the private space industry and these are some of the major questions that will be addressed in this note.

This note will take the position that over regulation would be potentially disastrous for the new industry. Caution should be used when lawyers around the world begin to create the framework that will govern this nascent industry. Furthermore, this note will outline the current model proposed in the United States, namely incorporating spacecrafts into the Federal Aviation Administration (FAA), and why this may or may not be the best route. Finally, it will discuss the liability regimes that should be in place for both the customers and employees of the future space flights.

II. ANSARI X PRIZE: THE DAWNING OF AN ERA

On October 4, 2004, the X PRIZE Foundation awarded $10 million to Scaled Composites and the Mojave Aerospace Ventures for the construction and successful flight of SpaceShipOne.[7]

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6. *See* discussion *infra* Part III.

7. *See* Ansari XPRIZE, *supra* note 4. SpaceShipOne was designed by Burt Rutan of Scaled Composites, while the technology and financing was provided by Paul Allen's Mojave Aerospace Ventures. Virgin Group Sign Deal With Paul G. Allen's Mojave Aerospace: Licensing the Technology to Develop the World's First Commercial Space Tourism Operator, http://www.scaled.com/projects/tierone/092704_scaled_paul_allen_virgin_galactic.htm (last visited May 9, 2009). Virgin Galactic, owned by Sir Richard Branson, has the exclusive right to the Scaled Composite designs and together plans to

SpaceShipOne succeeded in not only capturing the money, but also in reinvigorating interest in the commercial space industry.

The importance of this recent competition is obvious; without it, there would be no discussion of the private space industry, primarily because it did not exist until October of 2004.[8] SpaceShipOne was so successful in achieving its goals, that the United States Congress quickly moved to pass legislation immediately after its successful launch,[9] which laid the preliminary foundation for regulating commercial space activities by private companies.[10]

While the X PRIZE contest has been invaluable in jump-starting the private space industry, it has also brought a plethora of potential legal dilemmas. While SpaceShipOne was the first successful flight of a privately built and operated spaceship, it is not the first time vehicles have traveled into space. An important distinction to note is that all prior spacecrafts were government controlled, and the laws which governed space up until recently have clearly reflected this.

III. EXISTING LEGAL FRAMEWORKS FOR SPACE

The first major attempt to govern space and the manner in which the world interacts with it came about in the form of the Outer Space Treaty.[11] The treaty was signed by many countries in 1967 and still serves as the basic legal framework for governing outer space among the nations of the world.[12]

A majority of the treaty deals with issues on an international

operate the first commercial "spaceline." *See* Virgin Galactic, Overview, http://www.virgingalactic.com/htmlsite/overview.php (last visited May 9, 2009).

8. The last significant space endeavor was the landing on the moon. The X PRIZE Foundation acknowledges this problem, stating "[f]or the last 40 years, innovation in space flight had been stalled . . . ." X PRIZE, *supra* note 4.

9. Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (Dec. 23, 2004) [hereinafter "Commercial Act Amendments"].

10. Commercial Space Launch Act, 49 U.S.C. §§ 70101-70121 (2006) [hereinafter "Commercial Act"].

11. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, Jan. 27, 1967, 18 U.S.T. 2410, 610 U.N.T.S. 205 [hereinafter "Outer Space Treaty"].

12. *Id.* at 2464-98.

scale, such as limiting the use of nuclear weapons and military forces in space by all signatories to the treaty.[13] However, one of its primary purposes was to limit the legal jurisdiction any signatory to the treaty can exert over the skies above.[14] The treaty views space in the same light that the oceans of the world are viewed today; they can be used by all but governed by none.[15]

Numerous other international agreements and agencies dealing with activities in space have been created throughout the past few decades, such as the agreement which governs the International Space Station and the United Nations Committee on the Peaceful Uses of Outer Space.[16] While there have been a handful of agreements which provide basic legal frameworks, very few agreements provide the technical and specific details which are essential for providing a comprehensive system necessary to regulate space activity.

The main reason for this deficiency is likely due to the fact that until recently, the prospect of large numbers of individuals entering space seemed remote. Even more remote was the prospect of private companies engaging in space travel, in a domain historically reserved for governments with far larger budgets.[17]

Two international efforts have taken a comprehensive approach

13. *Id.* at art. 5. The article bans all forms of military weaponry including, "plac[ing] in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction." *Id.*

14. *Id.* at art. I (stating that "exploration and use of outer space, including the moon and other celestial bodies, shall be carried out for the benefit and in the interests of all countries.").

15. *Id.* "Outer space, including the moon and other celestial bodies, shall be free for exploration and use by all States without discrimination of any kind, on a basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies." *Id.*

16. *See* Ka Fei Wong, *Collaboration in the Exploration of Outer Space: Using ADR to Resolve Conflicts in Space*, 7 CARDOZO J. CONFLICT RESOL. 445, 455 & n.76 (2006) (noting that the Space Station Agreement was signed by the United States, Canada, Japan, and the European Space Agency); *see generally* United Nations Committee on the Peaceful Uses of Outer Space, http://www.unoosa.org/oosa/COPUOS/copuos.html (last visited May 9, 2009).

17. Only recently has the cost of space travel technology become realistic. Development of SpaceShipOne cost roughly $20 million. Jo Twist, *Burt Rutan: Aviation Pioneer*, BBC NEWS, Oct. 4, 2004, http://news.bbc.co.uk/1/hi/sci/tech/3746313.stm.

to the problem concerning liability for entities in space, though even these efforts are still insufficient in many respects. The Convention on International Liability for Damage Caused by Space Objects ("Liability Convention"), covers many aspects of liability that are not addressed by the Outer Space Treaty.[18] The Convention primarily imposes complete liability onto the nation from which the spacecraft originates, should any problems arise from either the craft itself or associated activities.[19] Despite the improved legal regulations that came about as a result of the Liability Convention, it only applies to state actors, not individuals or private entities.[20]

The other major piece of legislation, domestic in origin, is the Commercial Space Launch Activities Act ("Commercial Act") passed by Congress in 1984.[21] The Act established a preliminary legal framework to regulate private entities entering space by requiring licenses, insurance, registration, and hindering the ability of companies to circumvent these requirements by launching from foreign territories.[22]

In December of 2004, Congress amended the act to provide a more comprehensive legal framework for the regulation of private entities that wish to engage in space travel.[23] One of the primary changes in direction this act took was to place the regulation of space flight under the auspices of the FAA.[24] Despite this new piece of legislation, many questions remain unanswered and further, it remains to be seen if applying FAA regulations to the space industry is the correct course to take.[25]

While the Commercial Act is a good start, it is far from comprehensive; the Act is fairly basic and surprisingly simple for

18. Convention on International Liability for Damage Caused by Space Objects, Mar. 29, 1972, 24. U.S.T. 2389 [hereinafter "Liability Convention"].

19. *Id.* at art. 2.

20. *See* Wong, *supra* note 16, at 451 (noting that the "Liability Convention deals primarily with state responsibility.").

21. Commercial Act, *supra* note 10.

22. *See id*. §§ 70104-70107, 70112-70113.

23. Commercial Act Amendments, *supra* note 9.

24. 49 U.S.C. § 70103(a).

25. Given the substantial differences in cost and risk, applying aviation law may result in undesired results. *See* discussion *infra* on pp. 312-16.

federal regulations, seeking only to lay the preliminary framework for a more complex system of space regulation in the future. The act does, however, attempt to regulate some particular aspect of space flight with more complexity, such as demanding that all who attempt to launch any structure or vehicle into space must obtain a license from the United States Government.[26]

The only other element of space travel that is afforded any meaningful discussion concerns the necessity of liability insurance.[27] The Commercial Act mandates that insurance must be obtained by any entity wishing to launch space vehicles and that it must be for at least $500,000,000.[28] The federal government will cover anything beyond that amount, but not exceeding $1.5 billion.[29]

Even a cursory glance of the Commercial Act demonstrates that the federal government has only begun to seriously look at controlling space activities. The Act is sparse and lacking provisions on numerous issues from safety standards to liability in the event of a major catastrophe.

A. Federal Aviation Law

In order to better understand whether the law that governs airplanes would be a proper fit for the space industry, an analysis of current airline law is necessary. The FAA, under the Department of Transportation,[30] regulates and governs the law surrounding airplanes and all things that fly, deriving its authority from the Federal Aviation Regulations ("FAR"). [31] The FAR controls every aspect of flying a plane, from air traffic control, to aircraft maintenance to the acquisition of licenses for pilots.[32]

26. 49 U.S.C. § 70104-70105. Despite several provisions pertaining to licenses, little detail is offered as to what an individual or company needs in order to obtain a license. *Id.*

27. *Id.* §§ 70112-70113.

28. *Id.* § 70112(a)(3)(A)-(B).

29. *Id.* § 70113(a)(1)(B).

30. U.S. Department of Transportation, DOT Agencies, http://www.dot.gov/DOTagencies.htm (last visited May 9, 2009).

31. *See generally* Federal Aviation Administration, Department of Transportation, 14 C.F.R. pts. 1-199 (2008).

32. *Id.*

As can be expected from such a large and complex industry, there have been thousands of adjudications that concern liability with respect to both the government and the companies involved with the ferrying of people through the skies. Despite the large plethora of case law, several cases in particular are helpful for an analysis of how these laws may play out if applied to the space industry.

A good place to start is first to determine who is liable in the event of a crash. Under the Liability Convention, the country of origin is responsible if the spacecraft crashes in another country.[33] But what if it crashes in the country of origin? What if the government tries to shift some or all of the cost onto the private company? In the case of *Cappello v. Duncan Aircraft Sales of Florida, Inc.*,[34] the court dealt with a plane crashing in a mountain range within minutes of takeoff.[35] At the trial level, the court found that the pilot and the air traffic controllers were comparatively negligent.[36] The Court of Appeals found that the pilot assumed the risk by failing to receive the proper training and that the air traffic controllers did all they could given the pilot's inexperience.[37]

With regard to damage to the aircraft itself, in *Palomo v. United States*,[38]the court addressed a similar situation where the pilot encountered adverse weather conditions and eventually crashed.[39] The court held that the air traffic controller had done all he could in warning the pilot and that the pilot's negligence caused the accident.[40]

33. *See supra* note 18.

34. 79 F.3d 1465 (6th Cir. 1996)

35. *Id.* at 1467.

36. *Id.* In Jackson v. United States, 156 F.3d 230, 236 (1st Cir. 1998) the First Circuit found that the pilot had been contributorily negligent despite the failure of the air traffic controllers to properly advise him of the adverse weather conditions.

37. *Capello*, 79 F.3d at 1469 ("[C]ontrollers must be able to assume that pilots are complying with FAA regulations and understand their circumstances in the absence of a pilot request or other notice to the contrary.").

38. CV No. 1:96cv29GR, 2000 U.S. Dist. LEXIS 22234 (S.D. Miss. May 31, 2000).

39. *Id.* at *3-8.

40. *Id.* at *38-39.

In *Egan v. Omniflight Helicopters, Inc.*,[41] the court dealt with a pilot who was not adequately trained to operate a helicopter.[42] The pilot was employed by a company that contracted with a third party for pilot services.[43] The court held that the third party owed the pilot no duty and that the pilot had assumed the risk by failing to receive proper training.[44] What can be inferred from these cases is that the tort law principles of liability and negligence extend to airplanes, though there certainly appears to be more tolerance for applying assumption of risk when individuals choose to get on board an aircraft.[45] The significant question is whether it is appropriate to apply case law directed at aircrafts to the nascent private space industry.

IV. SHOULD FEDERAL AVIATION LAW APPLY TO THE SPACE INDUSTRY?

Applying federal aviation law, or any field of conventional law, to spacecraft poses unique problems in the context of space travel. Consider the following hypothetical illustrating the substantial and difficult problems that the burgeoning space industry may face in the future.

The year is 2017. Virgin Galactic has recently developed its latest private spacecraft, Spaceship IV, capable of ferrying up to thirty people over 100 miles above the planet's surface. This spaceship is far larger and faster than any of its predecessors. The vessel launches from the deserts of New Mexico and quickly climbs up to its appropriate height, orbits the planet twice, then begins preparations for its return to Earth. During its descent as it re-enters Earth's atmosphere, a malfunction occurs and the pilot loses control of the ship and it begins to spin wildly out of

41. 639 N.Y.S. 2d 77 (N.Y. App. Div. 1996).

42. *Id.*

43. *Id.* at 77-78.

44. *Id.* at 78 (stating that it would be "completely unreasonable for the decedent to expect [the third party] assumed a duty to protect him from his own inability to safely pilot the helicopter.").

45. This is likely attributable to the fact that flying in an aircraft is inherently more dangerous than numerous other human activities. *See infra* note 61.

control.[46] Given that a spaceship, unlike a plane, flies dozens of times the speed of sound, it is nearly impossible to do anything to prevent the ship from hurtling on whatever course gravity takes it.[47]

Now we have a scenario of a large metal spaceship, larger than the current Space Shuttle, loaded with volatile rocket fuel, hurtling out of control at dozens of times the speed of sound, and likely to be on fire, given the friction produced when a ship enters the earth's atmosphere.[48] Given the speed at which the ship is traveling, no weapon or other method currently exists which could either destroy the shuttle or even divert its trajectory. The spaceship, now a giant fireball, crashes into a major metropolitan area in Tokyo, killing hundreds, wounding thousands and causing hundreds of millions of dollars in damage to the city itself.

Additionally, all passengers would have died as soon as the pilot lost control 75 miles above the surface. While this is an extreme example, it is certainly not out of the realm of possibility. The catastrophe also illustrates the multiple problems associated with space law and how much still needs to be addressed.[49]

As discussed previously, the Liability Convention holds the launching nation responsible for any and all damage.[50] However, the damage involved in this hypothetical, including the loss of life and property, easily surpasses several hundred million dollars and would likely reach several times that number.[51] The government

46. The Space Shuttle Columbia and Challenger disasters are prime examples of the possibility of such malfunctions. *See infra* note 61.

47. The space shuttle orbits the planet at over 17,000 miles an hour. *See* Re-Entry Aircraft, http://www.grc.nasa.gov/WWW/BGH/hihyper.html (last visited May 9, 2009).

48. Re-entry temperatures can top 3,000 degrees Fahrenheit. *See* Shuttle Technology, Thermal Protection System, http://history.nasa.gov/sts1/tech.html (last visited May 9, 2009).

49. Critics of such a hypothetical situation will compare it to an airplane crash and state that there is an equal chance of a plane causing as much damage. This argument is unfounded. Airplanes are much slower, are far easier to control in an emergency and fly on designated paths that rarely go over the heavily populated center districts of major cities. For a prime example of the problems of space flight, one need only look at the Space Shuttle Columbia disaster; had the shuttle crashed into a major city, the damage would have been catastrophic.

50. *See* Liability Convention, *supra* note 18.

51. To reach such a figure, one must take into account the cost of the space ship, the property damage resulting from the crash, and the medical fees for

will not be pleased with having to cover this bill and having to mend its relations with the foreign country.

The natural course of action would be to seek redress from the company for any negligent or reckless behavior on either the part of its pilot, its launch crew, its engineers or the designers of the spaceship itself.[52] The families of both those on board and those killed in the crash would have similar causes of action.

As we consider the proposed scenario, we are forced to revisit the original question: should we apply federal aviation law to the space industry? The hypothetical points to a conclusion that such a situation would render the normal legal procedures woefully obsolete. The obvious problem with the abovementioned reimbursements is that no burgeoning space corporation will last very long if this scenario happens even once. The damage to its reputation alone, not including the gigantic monetary costs, would destroy any future prospects for a company whose ship meets such a fate. Holding the company even fifty-percent liable would lead to the same disastrous results.[53]

The insurance provision found within the Commercial Act illustrates the potential liability a company may face.[54] The United States Government has calculated how much a space related disaster could potentially cost, which explains why it mandates that a commercial space company maintain liability insurance of up to $500,000,000.[55] Setting aside the cost of maintaining the liability insurance itself, the costs to the space company are already, by the United States Government's own admission, potentially great. This point is only reinforced by the fact that the government is willing to pay up to $1.5 billion beyond the policy limit, a commitment that

injuries and payouts resulting from deaths.

52. The United States Government requires all space-faring companies to have insurance up to $500,000,000. *See* 49 U.S.C. § 70112. Despite this protection, it is likely that any accident involving a space shuttle would be so catastrophic that insurance companies would be unable to afford the insurance costs.

53. For public policy purposes, it may also be wise to reduce the burdens on space companies, as this may make them more inclined to leave the country for cheaper pastures.

54. 49 U.S.C. § 70112(a).

55. *Id.*

the government would never make if it did not think it necessary.[56] Despite the potential for great costs to any company entering this field, there are possible solutions to alleviate this burden.

Shielding a private company is not unheard of in the American legal system, or even in the aviation context. A good example is *Shaw v. Grumman Aerospace Corp.*, which involved a military aircraft that crashed into the ocean within seconds of its launch.[57] The pilot was killed and his father sued Grumman Aerospace, the designer of the aircraft, for damages.[58] The Court described the purpose of the military contractor defense as:

> permit[ting] the government to wage war in whatever manner the government deems advisable, and to do so with the support of suppliers of military weapons. Considerations of cost, time of production, risks to participants, risks to third parties, and any other factors that might weigh on the decisions of whether, when, and how to use a particular weapon, are uniquely questions for the military and are exempt from review by civilian courts.[59]

This defense effectively bars judicial action with respect to military testing which may prove dangerous. Given the fact that such a bar to liability already exists in the American legal system, it would not be a far leap to apply such a system in the context of private space tourism, an equally dangerous endeavor. The risks associated with military aviation, as well as the tremendous costs, effectively force the participants to assume the risk, which in turn ensures the continuation of the given program. Private space tourism is also costly and extremely risky, allowing for a valid and logical conclusion that bars holding the company liable for a great bulk of any potential damages stemming from a disaster.

The bottom line for the American government and the public is that if fostering the private space industry is a worthy goal that these actors desire, a large amount of leeway must be given to these young companies.[60] With space travel being a very dangerous and

56. *See id.* § 70113(a)(1)(B).

57. 778 F.2d 736, 736 (11th Cir. 1985).

58. *Id.*

59. *Id.* at 740 (quoting In re "Agent Orange" Prod. Liab. Litig., 534 F. Supp. 1046, 1054 n.1 (E.D.N.Y. 1982)).

60. *See supra* text accompanying notes 54-56. However, the costs of paying

unpredictable undertaking, numerous problems are going to occur. The history of space flight is full of tragedies and there undoubtedly will be more in the future.[61] If we want the private space industry to mature, then good faith efforts to expand human presence off this planet must be virtually exempt from liability. This is not to say that any mistakes on the part of the company will be forgiven; fraud and willful misconduct should be accounted for. But in effect, the federal government should, at least until costs come down and the industry grows, bite the bullet and absorb most of the costs involved with any problems.[62]

V. ASSUMPTION OF RISK: THE SCOURGE OF ALL CUSTOMERS

In the late ninetieth century and early twentieth century, U.S. courts sought to protect the numerous burgeoning industries by shifting liability from the companies to the consumers and customers.[63] Forcing the public, however, to assume the risk of dangerous activities resulted in numerous situations where plaintiffs sustained injury or were killed, and received little or no compensation for either themselves or their families.[64] Assumption of the risk was even more prevalent in the work environment,

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the insurance company after a disaster of such magnitude will likely bankrupt any company.

61. *See*, *e.g.*, NASA Apollo Mission Apollo-1, http://history.nasa.gov/Apollo204/ (last visited May 9, 2009) (explaining how a flash fire in a command module killed three astronauts); Shuttle Triumphs and Tragedies, http://aerospacescholars.jsc.nasa.gov/HAS/Modules/Shuttle-to-Station/2/6.cfm (last visited May 9, 2009) (describing how the Space Shuttle Challenger and its seven-person crew died from a solid rocket booster's failure).

62. This problem appears to be recognized but unresolved. *See* Commercial Space Transportation Competitiveness Act of 200, Pub. L. No. 106-405, 114 Stat. 1751 (codified as amended at 49 U.S.C. § 70101 (2000)) (Number four of the findings section states, "during the next 3 years the Federal Government and the private sector should analyze the liability risk-sharing regime to determine its appropriateness and effectiveness, and, if needed, develop and propose a new regime to Congress.").

63. *See* Shirley A. Irwin, Comment, *Torts*—Glass v. City of Chattanooga: *The Abolishment of the Fellow Servant Doctrine in Tennessee*, 25 U. MEM. L. REV. 317, 320, n.30 (1994).

64. *See* Boering v. Chesapeake Beach Ry. Co., 193 U.S. 442, 448-49 (1904) (upholding the validity of a train ticket which stated anyone who purchased the ticket absolved the train company of any liability stemming from an accident).

rendering employees negligent in almost every instance that resulted in an injury.[65] The doctrine of assumption of risk however, has since fallen out of favor in the judicial system and the public's tolerance for such a doctrine has greatly diminished. But could such a seemingly archaic legal device be the answer for protecting the future private space industry?

The basic theory behind assumption of the risk is "that the plaintiff, in advance, has given his express consent to relieve the defendant of an obligation of conduct toward him, and to take his chances of injury from a known risk arising from what the defendant is to do or leave undone."[66] It is hard to imagine that flying commercial vehicles into space is not incredibly dangerous.[67]

It seems reasonable for a company to demand that all who ride on their space vehicles waive virtually all rights they may have on the ground and absolve the company of any liability. The risk inherent in space travel does not seem to be deterring anyone from building these spaceships and there certainly is no shortage of individuals willing to risk their lives for a chance to reach the stars.[68] Combining the dangerousness of such flights with the burgeoning industry's need for substantial government protection yields one formula that can sustain the private space industry.

The other choice is to do what the American legislative system seems to do best: heavily regulate this new frontier and attempt to place total liability on the shoulders of private space industry and

65. *See e.g.*, Brief submitted in support of Defendant, Texas & P. R. Co. v. Bourman, 212 U.S. 536, 537 (1909), 1909 U.S. LEXIS 1837 (reiterating the law at the time, "a servant entering employment impliedly agrees with his master to assume all ordinary risks incidental to the service."); The Osceola, 189 U.S. 158, 175 (1903) (involving an injury at sea, which the Court concluded, "the seaman is not allowed to recover an indemnity for the negligence of the master.").

66. BLACK'S LAW DICTIONARY 121 (7th ed. 1999) (citation omitted).

67. *See supra* note 61.

68. Sir Richard Branson, owner of Virgin Galactic, stated that he "hope[s] to create thousands of astronauts over the next few years and bring alive their dream of seeing the majestic beauty of our planet from above . . . ." *Now Virgin to offer trips to space*, CNN.com, Sep. 27, 2004, http://www.cnn.com/2004/WORLD/europe/09/27/branson.space/index.html (last visited May 9, 2009). There clearly is a goal to make space travel affordable and, recently, many people were willing to spend the $200,000 necessary for a flight to space. Michael Y. Park, *Celebrities Shoot for the Stars . . .Literally*, FOX NEWS, Oct. 2, 2006, http://www.foxnews.com/story/0,2933,216965,00.html.

the government.[69] This position can be argued, given that space tourism is a very dangerous endeavor. However, government micromanagement of the private sector rarely produces desirable results.[70]

It is in the government's interest to see this industry grow for a whole range of reasons outside the general tourism context.[71] For the government to apply standard tort liability principles on the private space industry would likely ensure a slow progression at best. It is in the government's and the public's best interest to see that these private space companies develop, even if it means applying policies and laws that we would normally deem unacceptable in other contexts.[72]

VI. HOTELS IN ORBIT

Flights on spacecrafts are only part of the space tourism equation. Structures and halfway points will be necessary for those wishing to remain in space more than a few hours. On longer trips, there will be the need for rest and relaxation before completion of the journey. Structures, or "space hotels," will undoubtedly begin to emerge as the private space industry grows.[73] The same laws

69. *See generally* Steven Freeland, *Up, Up and. . .Back: The Emergence of Space Tourism and Its Impact on International Law of Outer Space*, 6 CHI. J. INT'L. 1, 18 (2005). Mr. Freeland's article is an objective analysis of the future dilemmas of space tourism, though a careful reading leads to the conclusion that he supports a far more comprehensive liability regime than the one in place and one more complex than this article deems necessary. *Id.* He also disagrees with applying the assumption of risk doctrine to any future space liability regime, stating, "many will argue that space tourists [] voluntarily accept the inherent risks associated with space travel and thus liability should be limited to balance this assumption of risk." *Id.* at 18.

70. *See* Abner J. Mikua, *Deregulating Through the Back Door: The Hard Way to Fight a Revolution*, 57 U. CHI. L. REV. 521, 527 (1990).

71. Most of the resources which humanity will use in the future will be mined from outer space, making our ability to travel into space imperative. *See* Near-Earth Objects as Future Resources, http://neo.jpl.nasa.gov/neo/resource.html (last visited May 9, 2009).

72. This need only be a temporary solution. Once a few major companies become involved and the technology becomes safer, more modern forms of tort law can be applied once again. As with most technologies, e.g. the airline industry, the costs and risks associated with them will inevitably decrease.

73. *See infra* note 77.

that seek to control space flights are conspicuously absent when the concept of fixed orbiting structures come into the discussion.[74] More importantly: should current aviation and tort law be used to regulate these structures or should the assumption of risk liability structure put forth in this note be the appropriate model?

In July 2006, Bigelow Aerospace Corporation launched a module into orbit, designed to test the feasibility of an expandable structure that is a prototype for the first viable space hotel.[75] A newer, more advanced model was launched a year later in June 2007.[76] The company's stated purpose is to create a large structure in Earth's orbit that will act as a place where commercial enterprises can congregate, essentially making this structure nothing more than an orbiting hotel with a mall.[77] Currently, no international or U.S law governs or regulates any of the parameters surrounding the construction and maintenance of such a structure. Title 49 of the United States Code makes no direct or indirect mention of either hotels or other similar structures.[78]

The most likely mode of regulation will almost undoubtedly come in the form of an expansion of the Commercial Act, with a similar incorporation of existing tort and aviation law as has been attempted with regards to private space vehicles. Is this an appropriate course that our legal system should take? The short

74. *See* discussion *infra* p. 321.

75. *See* Commercial Spacecraft and Complexes, Genesis I, http://www.bigelowaerospace.com/genesis_I/ (last visited May 9, 2009).

76. *See* Commercial Spacecraft and Complexes, Genesis II, http://www.bigelowaerospace.com/genesis_II/ (last visited May 9, 2009).

77. *See* Commercial Spacecraft and Complexes, http://www.bigelowaerospace.com (last visited May 9, 2009). As technology improves, locations for space vehicles to dock at will become necessary, especially as the demand to enter space increases. To address this need Bigelow's Genesis units are "on schedule to provide a low-cost, low-Earth orbit space complex that is accessible to the private sector for commercial activities." The Genesis units "can be adapted for a variety of missions and is designed to provide increased volume, enhanced safety and reduced costs to the extent that space-based activities will become more affordable for entrepreneurs, small businesses and the public at large." Space Travel, *Bigelow Aerospace And Lockheed Martin Converging On Terms For Launch Services*, Feb. 7, 2008, http://www.space-travel.com/reports/Bigelow_Aerospace_And_Lockheed_Martin_Converging_On_Terms_For_Launch_Services_999.html.

78. *See generally* Commercial Act, *supra* note 10.

answer is probably no. Although there are large differences between space flights and fixed, orbiting structures, the latter faces different and potentially more costly problems than the former.

A good place to start when discussing any future space hotel is to make a comparison to the existing International Space Station. Liability is shared among the major sponsors of the station.[79] Unlike a space vehicle, however, the probability that the International Space Station would fall from the sky if a major catastrophe were to occur is small.[80] For this reason the same risks that flying space ships face are not shared by their orbiting cousins. But the possibility of a problem occurring, especially one which could potentially destroy the entire structure, is always a constant fear.[81] So while an orbiting structure such as the International Space Station does not share the same costs and risks that a flying spaceship does, it has its own built-in risks that can potentially be even more costly.

The main reason for advocating an assumption of risk theory of liability with regards to space activities is that the cost of doing business in this environment at this point in history is simply too high for any one company at the moment to bear. While the costs to launch and assemble the structures in orbit are not overly substantial, there are significant costs attributable to the modules and structures themselves.[82]

If the International Space Station were to suddenly incinerate tomorrow, the nations participating would have lost a multibillion-dollar structure.[83] A substantially large portion of that amount

79. *See supra* note 18, at art. 5.

80. Note how satellites simply orbit the planet with no form of power or propulsion keeping them from falling to the surface. *See* Artificial Satellites, http://www.nasa.gov/worldbook/artificial_satellites_worldbook.html (last visited May 9, 2009). A satellite could fall as a result of air molecule impacts or pressure from the sun's energy causing the satellite to lose speed and be caught in Earth's gravity. *Id.*

81. Several important computer systems crashed rendering various systems on the International Space Station inoperable. Tariq Malik, *More Progress Made to Recover Space Station Computers*, SPACE.com, http://www.space.com/missionlaunches/070616_iss_computer_prog.html (last visited May 9, 2009).

82. *See infra* note 83.

83. The cost of the International Space Station is estimated at over $100

accounts for the highly technical and expensive equipment present on it. However, even the low estimate that Sir Richard Branson provides puts the cost of initial ventures into space into extremely expensive territory.[84]

The primary source of liability that will stem from any orbiting space structure will be placed on the shoulders of the individuals who remain on the station, living, eating and working. Should a problem arise, and death and injury unfortunately befall these people, the company would be the first place that they themselves or their estates would go to in order to be compensated. Given the likelihood of injuries and deaths in the beginning phases of space travel, a liability regime, which governs these harms as they relate to employees, should be in place.

VII. LIABILITY FOR EMPLOYEES

An important aspect of this discussion is an analysis of the liability regime that would apply to employees of the space ships and space hotels, not just potential customers. Should employees and pilots be forced to assume the risk or should they be allowed some form of compensation?[85]

billion. International Space Station - How much does it cost?, http://www.esa.int/esaHS/ESAQHA0VMOC_iss_0.html (last visited Mar. 5, 2008).

84. Sir Richard Branson estimates it will cost at least $100 million to jump-start the space tourism industry and would initially cost $200,000 per person. Carolyn Said, *British Tycoon Wants to Fly You to Space*, SAN FRANCISCO CHRONICLE, Sept. 28, 2004, http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2004/09/28/MNG99906EQ1.DTL (last visited Mar. 5, 2008). Recently, however, Virgin Galactic predicted that the cost of tickets would drop to $20,000 after the first year; though still not an insignificant amount. *See* FAQ's, Space Ticket, http://www.virgingalactic.com/htmlsite/faq.php?subtitle=Space%20Ticket&src=296 (last visited Mar. 5, 2008).

85. *See* Heather A. Douglas, *Death in Pursuit of Space Travel: An Analysis of Current Methods of Recovery for Families of Astronauts and the Need for Reform*, 26 WHITTIER L. REV. 333, 355 (2004). Douglas notes that since the U.S. government does not seem to mind denying significant coverage for astronauts, it may treat customers and commercial space travel employees similarly. *Id.* Douglas also notes that "[t]he foregoing examination of current American space law demonstrates that there is no *real* functional remedy against the United States or NASA for families of victims of space tragedies." *Id.*

Unlike the risk assumed by customers on these galactic endeavors, an assumption of risk liability does not fit when applied to the employees. The problem with applying the assumption of risk doctrine to employees rather than customers is one of probability. Flying and living in space is a risky proposition. Despite the risk, many are willing travel around the planet or to visit an orbiting hotel.[86] However, the number of individuals who are willing to risk it all repeatedly on a monthly basis is smaller.

While an individual might assume the risk for the first and second outing, few people, if any, will repeatedly risk their lives on a weekly basis knowing that they and their families will not be compensated for any potential loss.[87] Unless commercial space companies are willing to pay exorbitantly high salaries to their employees, then they will have no choice but to compensate their pilots and employees in the event of a catastrophe.

Realistically, since employees and pilots will have to be compensated whether by high salaries or guaranteed benefits, the primary question is to what extent will space-faring companies compensate their employees? As has been proposed by this note, any compensation outside the scope of reason will likely be highly damaging to any emerging space company.

Surprisingly, the Commercial Act actually addresses this issue in some detail.[88] Rather then addressing whether an employer should compensate an employee for potential dangers, it addresses the situation of whether an employer is responsible for an employee's actions.[89] The relevant provision of the act provides that all "contractors, subcontractors, and customers, and contractors and subcontractors of the customers" are liable for any "property damage or loss it sustains, or for personal injury to, death of, or

86. *See supra* note 84.

87. Despite the logic of this argument, some jobs that put employees at significant risk do not sufficiently compensate them or their families in the event of a disaster, e.g., Military service men and women, police officers and firefighters.

88. *See* 49 U.S.C. § 70112(b)(1).

89. Title 49 discusses waiver of claims between those receiving a license to operate in space and those who would bring potential disaster to a space flight. *Id*. Though spoken in terms of license transfers, it effectively covers any employee brought onto a space vessel. *Id*.

property damage or loss sustained by its own employees resulting from an activity carried out . . . ."[90] This provision of the Commercial Act appears to make all the costs associated with the actions of the employee the responsibility of the employer to cover.[91] As this note proposes, forcing too much of the liability burden upon the companies will likely prevent the growth of commercial space travel. Holding companies strictly liable for any and all activities performed by their employees are slightly harsh and not what is required in the current environment of nascent space companies.

Applying this mentality to the original question of how much an employer should compensate an employee for disasters, it seems the government is content on placing a large burden on the companies, while seemingly failing to recognize the large potential costs with such a fee-shifting maneuver. This type of liability regime could potentially hurt burgeoning space-faring companies.

Another ancillary issue that emerges under Title 49 is whether companies or someone else is responsible for any and all activities that may result on the spaceship. The Commercial Act seems to be crafted in a way that protects employees and customers from a space related disaster.[92] But what if an employee gets into an argument with a customer and the resulting argument leads to a death aboard the ship? What if the fight causes serious damage to a portion of the hull that in turn could lead to serious problems for the ship and everyone else on board? Too what extent are these companies responsible for the actions of their employees? The Commercial Act simply does not address these issues in any detail.[93]

The problem with addressing these specifics is that there has been not been any significant judicial interpretation of any of these

90. *Id.* The statute makes specific reference to "launch or reentry license". *Id.* § 70112(b)(2).

91. 49 U.S.C. § 70112(b)(1).

92. *See id*. § 70112(b)(2). The statute states that anyone possessing a license is responsible for damages caused "resulting from an activity carried out under the applicable license." *Id*. This language would appear to imply that employers would only be responsible for problems which directly result of their space operating licenses.

93. See generally Commercial Act, *supra* note 10.

commercial space statutes, primarily because there have not been any private space flights. However, with the recent unveiling of SpaceShipTwo, the advent of commercial space flights should solve this problem.[94] However the courts of this country come down on such issues, they would be wise to keep the interest of these businesses in mind. Despite the modern aversion to the doctrine, assumption of risk should play a large part in any future space liability regime.

VIII. CONCLUSION

Within a matter of a few years, humans will begin to travel on a fairly regular basis to the frontiers of space. Commercial space travel is still in its infancy, but soon it will become a frequent event that some will take part while others simply observe. Regardless of one's interaction with this new endeavor, laws will need to be carefully crafted to balance the desires for safety against the needs of promoting competition and protection for this burgeoning industry. This will need to be kept in mind when all aspects of a future liability regime are engineered, be it for companies, the government, customers or employees.

As history has shown, over regulation usually leads to unnecessary micromanaging, which in turn can stifle innovation and potentially cripple young industries. At the same time, any industry cannot be allowed to simple dictate its own terms of service. A careful balance must be struck, especially in the coming critical years when the world will be closely watching the steps commercial space travel takes. While we must be careful to stimulate and promote this young vibrant industry, we must be careful not to let it run wild.

While many individuals may not favor it, an assumption of risk liability regime is a natural fit for any adventure one may take into space. It protects the new companies from potential bankruptcy and helps to guarantee the survival of the industry. At the same time, anyone riding on a spacecraft is well aware of the potential risks involved. No one will be able to believably state they were

94. *See* Alan Boyle, *First Look at SpaceshipTwo*, MSN COSMIC LOG, Jan. 23, 2008, http://cosmiclog.msnbc.msn.com/archive/2008/01/23/601315.aspx.

unaware of the risks involved with flying atop a rocket engine into the cold vastness of space.

For those that find it hard to stomach such a regime, one need only look to the past to find the answers of the future. When airplanes first arrived on the scene, assumption of risk was used far more extensively. As the industry matured and technology improved and became more reliable, the justifications for keeping the assumption of risk doctrine dissipated. The same reasoning can be applied to the space industry; they should not be given carte blanche in the long term.

The commercial space industry is of critical importance to the continued expansion of the human race. As our population increases, new habitats and colonies will eventually be needed to ensure the planet's ecosystem does not collapse. By the same token, as human civilization expands, new resources will be needed to fuel our economies. Space provides ample supplies of all manner of minerals and resources. The steps being taken now are the precursors to a full-fledged viable space industry. It is of critical importance that the United States take steps to ensure its viability and continued expansion.

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