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Blast Off? — Strict Liability's Potential Role in the Development of the Commercial Space Market

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BLAST OFF? – STRICT LIABILITY'S POTENTIAL ROLE IN THE DEVELOPMENT OF THE COMMERCIAL SPACE MARKET

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I. INTRODUCTION

[1] The sun rises over the mountains in Southern New Mexico and the windows of Spaceport America blind those looking on at the terminal. A sudden boom shakes the ground and a plane unlike any other takes off toward the sky, leaving Spaceport America in the distance.[1] Virgin Galactic's[2] WhiteKnightTwo, bolstering an impressive 140-foot wing span

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[1] *See generally Image Gallery*, SPACEPORT AM., http://www.spaceportamerica.com/news/photo-gallery.html (last visited Nov. 7, 2010) (inspiring this fictional account through drawings of Spaceport America).

[2] While this Article focuses on Virgin Galactic, other entities are developing commercial space travel technologies. *See, e.g.*, Associated Press, *U.S. Space Tourism Firm Launches S. Korea Deal*, DAILY RECORD (Morristown, N.J.), Dec. 18, 2009, at UPDATES01 (reporting that Xcor Aerospace recently struck a deal with South Korea to conduct launches in that nation). Xcor must still complete the approval process and obtain the necessary export licensing, but the spaceship should be in the air by 2011. *See id.*

and the capacity to carry close to 8,000 pounds of fuel, speeds skyward carrying SpaceShipTwo, measuring in at sixty feet in length with a forty-two foot wide wing span, under its belly.[3] SpaceShipTwo carries six passengers and two crew members, all of whom wait anxiously for their ship to leave WhiteKnightTwo and, eventually, Earth.[4]

[2] During the first stage of the voyage, WhiteKnightTwo carries its cargo, including the eight lucky passengers, to an altitude of 50,000 feet.[5] As described by Virgin Galactic, the ride up "is marked with quiet contemplation but there's an air of confidence and eager anticipation" before SpaceShipTwo is released from the grasps of its carrier.[6] After that, pure excitement fills the passengers:

> [There is] a brief moment of quiet before a wave of unimaginable but controlled power surges through the craft. You are instantly pinned back into your seat, overwhelmed but enthralled by the howl of the rocket motor and the eye-watering acceleration which, as you watch the read-out, has you travelling in a matter of seconds, at almost 2500mph, over 3 times the speed of sound.[7]

[3] SpaceShipTwo speeds away from Earth into the upper layers of the atmosphere.[8] The thrilling view from the windows changes from familiar

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[3] *See* Guy Norris, *Quest for Space at Virgin Galactic*, AVIATION WEEK (Sept. 4, 2009), http://www.aviationweek.com/aw/generic/story_generic.jsp?channel=awst&id=news/VIRG09049.xml.

[4] *See id*.

[5] *See Overview – Experience*, VIRGIN GALACTIC, http://www.virgingalactic.com/overview/experience/ (last visited Nov. 9, 2010).

[6] *See id*.

[7] *Id*.

[8] *See id*.

blue skies to the black skies of space,[9] and the passengers' senses are alerted to the sudden change in their environment as "the world contained in [their] spaceship has completely transformed."[10] Passengers, likely for the first time, experience the magic of outer space.

> [T]he gravity which has dominated every movement you've made since the day you were born is not there anymore. There is no up and no down and you're out of your seat experiencing the freedom that even your dreams underestimated. After a graceful mid-space summersault you find yourself at a large window [looking at] a view that you've seen in countless images but the reality is so much more beautiful and provokes emotions that are strong but hard to define.[11]

[4] The crew then requests passengers to return to their seats in preparation for re-entry.[12] Gravity returns and passengers ready themselves for the strong g-forces associated with the return to Earth.[13] As the ship glides home, the passengers return to familiar surroundings and carry the knowledge "that life will never quite be the same again."[14]

[5] Such a voyage might seem out of this world, but Virgin Galactic expects to start commercial space flights in 2011.[15] Virgin Galactic already has a booking page on its website where, for a fee of $200,000 a

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[9] *Id*.

[10] *See Overview – Experience*, VIRGIN GALACTIC, http://www.virgingalactic.com/overview/experience/ (last visited Nov. 9, 2010).

[11] *Id*.

[12] *See id*.

[13] *See id*.

[14] *Id*.

[15] *See* Norris, *supra* note 3.

ticket and deposits starting at $20,000, potential passengers can reserve a seat on one of the first flights.[16] While the $200,000 price tag may prove too high for most people, Virgin Galactic promises the price will decrease over time,[17] much like the price of flat-screen televisions.[18] Yet even with the $200,000 bill, more than 350 people, collectively paying close to $40 million in deposits, already have incurred the cost to secure a seat.[19]

[6] Because commercial space travel is such a novel and unfamiliar experience, after potential passengers fill out the booking form Virgin Galactic contacts them to answer any questions.[20] Additionally, Virgin Galactic employs fifty travel consultants trained specifically to provide specialized information about the space flights.[21] The training for these specialized travel consultants includes trips to the "Kennedy Space Center at Cape Canaveral, Florida to learn about the history, physics, medical implications and specific flight details that are involved in suborbital flight, and experiencing weightlessness on ZERO-G, a specially modified Boeing 727."[22]

[7] But despite what appears to be the inevitable creation of a booming commercial space transportation industry, the possibility of commercial

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[16] *Booking*, VIRGIN GALACTIC, http://www.virgingalactic.com/booking/ (last visited Nov. 7, 2010).

[17] *See Overview – Space Tickets*, VIRGIN GALACTIC, http://www.virgingalactic.com/overview/space-tickets/ (last visited Nov. 7, 2010).

[18] *See* Norris, *supra* note 3. *See generally* David Goldman, *Flat-Screen TV Prices To Plunge for Holiday Season*, CNNMONEY.COM (Sept. 23, 2010, 03:44 AM), http://money.cnn.com/2010/09/23/technology/lcd_tv_prices/ index.htm.

[19] *See Park Avenue Travel; Park Avenue Travel's Joshua Bush, Local Accredited Space Agent to Witness World Premiere of Virgin Galactic SpaceShipTwo*, DEF. & AEROSPACE BUS., Dec. 23, 2009, at 64 [hereinafter *Park Avenue Travel*].

[20] *See Booking supra* note 16.

[21] *See Park Avenue Travel*, *supra* note 19.

[22] *Id*.

space travel raises questions of balancing safety concerns against the further development of a burgeoning business.[23] Virgin Galactic claims safety "is at the heart of the design of [its] new vehicles and will be engrained in the culture of [its] space line operation."[24] In particular, Virgin Galactic points to two safety features of its aircraft.[25] First, SpaceShipTwo will use a hybrid rocket motor, which gives pilots control of the rocket's thrust, and the ability to abort during the boost phase.[26] Second, SpaceShipTwo will use a feathered re-entry system that allows the spacecraft to re-enter the atmosphere without the excessive heat commonly associated with this phase of space travel.[27]

[8] Yet Virgin Galactic owner Sir Richard Branson admits that "[n]o new technology is without its risks, [a fact] one has to accept."[28] In 2004, the prototype for SpaceShipTwo "started rolling corkscrewlike on its way into space."[29] And in 2007, three engineers employed by Scaled

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[23] *See* Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (codified as amended in 49 U.S.C. ch. 701 (2004)) (amending 49 U.S.C. 70101, which identifies Congressional findings as to commercial space launch activities, to note that "a critical area of responsibility for the Department of Transportation is to regulate the operations and safety of the emerging commercial human space flight industry; [and that] the public interest is served by creating a clear legal, regulatory, and safety regime for commercial human space flight; and [finally that] the regulatory standards governing human space flight must evolve as the industry matures so that regulations neither stifle technology development nor expose crew or space flight participants to avoidable risks as the public comes to expect greater safety for crew and space flight participants from the industry.").

[24] *Overview - Safety*, VIRGIN GALACTIC, http://www.virgingalactic.com/overview/safety/ (last visited Nov. 7, 2010).

[25] *See id*.

[26] *See id*.

[27] *See id*.

[28] Transcript of *NBC Nightly News: Richard Branson To Offer Citizen Space Travel in 18 Months* (NBC television broadcast Dec. 7, 2009).

[29] *Id*.

Composites, LLC, a company partnering with Virgin Galactic to develop commercial space travel, died in a rocket engine explosion.[30] Still, Branson's faith in the technology is unwavering. As a testament to his confidence, Branson plans to take several family members with him on the pioneering first flight.[31] Such an intention indicates that, regardless of any inherent risks, Virgin Galactic is ready to move forward.[32] As accredited Space Agent Joshua Bush stated, "[w]e've already taken deposits from clients for a space flight, and the [December 23, 2009] unveiling of SpaceShipTwo moves us one step closer to actual travel."[33]

[9] Although Virgin Galactic has taken steps to assure the public that its flights are safe, the federal government appears to struggle with exactly how to regulate this new method of travel.[34] In particular, the government must determine how much, if any, regulation of spacecrafts like SpaceShipTwo and WhiteKnightTwo is appropriate to ensure the safety of those involved, while at the same time not interfering with the further development of the industry.[35] The Federal Aviation Administration ("FAA") and the Office of Commercial Space Transportation ("AST")

[30] *See id*; Ian O'Neill, *Scaled Composites at Fault for Fatal Explosion*, UNIVERSE TODAY, http://www.universetoday.com/12506/scaled-composites-at-fault-for-fatal-explosion/ (Jan. 19, 2008).

[31] *See* Transcript, *supra* note 28.

[32] *See id*.

[33] *Park Avenue Travel*, *supra* note 19.

[34] *See The Federal Regulatory Approach to Commercial Space Transportation: Hearing Before the Subcomm. on Sci. and Space of the S. Comm. on Commerce, Sci., and Transp.*, 111th Cong. 4 (2010) (statement of Dr. George C. Nield, Assoc. Adm'r for the Office of Commercial Space Transp., Fed. Aviation Admin.), *available at* http://legislative.nasa.gov/hearings/3-18-10%20NIELD.pdf.

[35] *See id*. at 4-6; *supra* note 23.

have dealt with similar questions since 2003.[36] To evaluate this issue, the FAA and AST have asked following:

> How does the addition of humans on board RLVs [reusable launch vehicles] affect/challenge FAA/AST's regulatory responsibility and regulatory approach? To what level of safety should they be allowed to fly.
>
> Should FAA/AST regulate human space flight by setting a limit on acceptable risk for humans on board RLVs?
>
> How should FAA/AST ensure the safety of humans on board RLVs?
>
> Are there lessons learned from commercial aviation that may be applicable to commercial space operations? What are they short of certification?[37]
>
> What, if any, type of liability, financial responsibility requirements, and/or liability risk-sharing regime should the U.S. government, via FAA/AST, seek to establish to protect passengers on board RLVs?"[38]

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[36] *See Virgin Galactic SpaceShip - Aerospace Technology*, AEROSPACE-TECH., http://www.aerospace-technology.com/projects/virgin-spaceship/ (last visited Nov. 10, 2010) (noting the maiden voyage of SpaceShip One occurred on May 20, 2003).

[37] Patricia Grace Smith, Assoc. Adm'r for Commercial Space Transp., FAA, *Long-Term Scenario for the Earth and Orbital Infrastructure,* Int'l Air & Space Symposium and Exposition (July 17, 2003) (transcript available at http://www.faa.gov /about/office_org/headquarters_offices/ast/media/PGS_AIAA_03-07-17.htm).

[38] Charity Trelease Ryabinkin, Note, *Let There Be Flight: It's Time to Reform the Regulation of Commercial Space Travel*, 69 J. AIR L. & COM. 101, 132- 33 (2004) (citing Office of the Assoc. Admin'r for Commercial Space Transp., *Commercial Human Space Flight*, FED. AVIATION ADMIN. (2003), http://ast.faa.gov/COMSTAC/May 2003/Wong-Human_Space_Flight.ppt).

[10] The answers to these questions do not come easily. If the government regulates too heavily, the industry could suffer the way some claim the rail industry has suffered due to overregulation by the Interstate Commerce Commission.[39] With too little regulation, the industry presents safety concerns for the passengers, employees, and the general public.[40] Interestingly, products liability may present an unlikely solution to this problem. Instead of attempting heavy regulation, Congress should adopt a strict liability approach for space flight operators similar to the approach used by the Pennsylvania Supreme Court in *Francioni v. Gibsonia Truck Corp*.[41]

[11] This Article evaluates the current and likely future state of federal regulation with respect to commercial space travel and proposes the adoption of the *Francioni* model of strict liability as a means to protect both public safety and the continued development of the space travel industry. Section II describes the current state of space travel regulation, particularly as it pertains to reusable launch vehicles ("RLVs"). Section III addresses how the international community handles liability regarding commercial space travel, as well as jurisdictional questions that may arise as a result of accidents associated with commercial space travel. Section IV discusses a plaintiff's ability, or lack thereof, to raise a claim under common law negligence, and Section V demonstrates why strict liability as applied to the manufacturers of the spacecraft will not protect passengers from the dangers of space travel. Finally, Section VI will

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[39] *See generally* Albert Churella, *Saving the Railroad Industry to Death: The Interstate Commerce Commission, the Pennsylvania Railroad, and the Unfulfilled Promise of Rail-Truck Cooperation*, BUS. & ECON. HIST. ON-LINE (2006), http://www.thebhc.org/publications/BEHonline/2006/churella.pdf.

[40] *See* Commercial Space Launch Amendments Act of 2004, Pub. L. No. 108-492, 118 Stat. 3974 (codified as amended in 49 U.S.C. ch. 701 (2004)) (amending 49 U.S.C. 70101, which identifies Congressional findings as to commercial space launch activities, to note that "the regulatory standards governing human space flight must evolve as the industry matures so that regulations neither stifle technology development nor expose crew or space flight participants to avoidable risks as the public comes to expect greater safety for crew and space flight participants from the industry.").

[41] *See generally* Francioni v. Gibsonia Truck Corp., 372 A.2d 736, 739 (Pa. 1977).

explain how the application of the *Francioni* model of strict liability will ensure the safety of the passengers, and, just as importantly, maintain the regulation-free environment essential for successful commercial space travel.

II. WAITING FOR THE FIRST MOVE – THE CURRENT STATE OF COMMERCIAL SPACE TRAVEL REGULATION

[12] The Commercial Space Launch Act of 1984 created the AST, which originally operated within the Department of Transportation.[42] In 1995, AST oversight was reassigned to the FAA, under which the AST continues to serve as one of six operating offices, and the only department responsible for space-related matters.[43] According to regulation, the AST operates as "a line of business within the Federal Aviation Administration [FAA],"[44] and works with the FAA to regulate commercial space transportation, which includes maintenance of extensive licensing procedures for the operation of launch and re-entry sites.[45] The primary duties of the AST include:

> Regulat[ing] the commercial space transportation industry, to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States;
> Encourag[ing], facilitat[ing], and promot[ing] commercial space launches and reentries by the private sector;
> Recommend[ing] appropriate changes in Federal statutes, treaties, regulations, policies, plans, and procedures; and

[42] Commercial Space Launch Act, Pub. L. No. 98-575, 98 Stat. 3055 (1984); ALEXANDER T. WELLS & CLARENCE C. RODRIGUES, COMMERCIAL AIR SAFETY 27 (Scott Grillo & David E. Fogarty eds., 4th ed. 2004).

[43] WELLS & RODRIGUES, *supra* note 42 at 26-27.

[44] 14 C.F.R. § 401.1 (2010).

[45] *See generally* 14 C.F.R. §§ 415, 433 (2010).

> Facilitat[ing] the strengthening and expansion of the United States space transportation infrastructure.[46]

[13] While the FAA does not have to follow the framework used to develop the safety standards for the nation's airports and commercial aviation providers to develop regulations for the commercial space travel industry,[47] a brief discussion of the history of regulation in the commercial aviation industry provides guidance into what the future of commercial space travel regulation may look like. The remainder of this section will take a brief look at the past and current state of commercial aviation and discuss the high potential of agency capture under the current regime.

A. A Brief Look Back – The FAA Regulation and Deregulation of the Commercial Aviation Industry

[14] The difficulties associated with safety regulation in the aviation industry have existed since the mid-1920s, when pilots returning from World War I "bought surplus war aircraft and went into business."[48] At the outset, the aircraft were used primarily for traveling aerial shows because the lower costs and ease of accessibility of the country's extensive water and rail systems made commercial air travel prohibitively expensive.[49] It was only in the wake of the creation of the United States Air Mail Service, and the regulations mandating that pilots attain a minimum of 500 hours of flying experience to be eligible for aerial mail delivery, that commercial aviation began to take form.[50]

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[46] *About the Office*, FED. AVIATION ADMIN., http://www.faa.gov/about/office_org/headquarters_offices/ast/ about/ (last updated Feb. 17, 2010) (describing the Office of Commercial Space Transportation, a branch of the Federal Aviation Administration); *see* 49 U.S.C. §§ 70101-19 (2006).

[47] In fact, the FAA likely will take a much more streamlined approach because it has a better idea of what works based on its previous work regulating the commercial aviation industry.

[48] WELLS & RODRIGUES, *supra* note 42, at 3.

[49] *See id*.

[50] *See id*. at 3-4.

[15] Since the federal government had not created a safety program for aviators, "a number of states [passed] legislation requiring aircraft licensing and registration."[51] Local governments also added to the safety regulations, "enact[ing] ordinances regulating flight operations and pilots, [which created] a patchwork of safety-related requirements. . . ."[52]

[16] Eventually, Congress passed the Air Commerce Act of 1926, which gave the Department of Commerce the authority to regulate air commerce.[53] In accordance with this authority, the Air Commerce Act of 1926 imposed upon the Department of Commerce several duties, including the duties to: promote air commerce, which entailed the responsibility to create air navigation facilities and airports, investigate air navigation accidents, investigate the development of the aeronautical industry, and advise the executive branch regarding the improvement of air navigation; regulate and maintain the standards of acceptable aircraft, airmen and facilities; regulate facilities, crafts and airmen connected with interstate and foreign commerce; and create air traffic safety rules.[54] The authority and duties identified in the Air Commerce Act of 1926 laid the foundation for the establishment of what is now the FAA, and are the same regulations and responsibilities under which the FAA continues to function.[55]

[17] The first federal aviation regulations were crafted following "substantial input from aircraft manufacturers, air transport operators, and

[51] *Id*. at 4.

[52] *Id*. at 4.

[53] *See* Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568. The act defines "Air Commerce" as "transportation in whole or in part by aircraft of persons or property for hire, navigation of aircraft in furtherance of a business, or navigation of aircraft from one place to another for operation in the conduct of a business." *Id*.

[54] *See id*. at §§ 2-3, 5-7; *see also* WELLS & RODRIGUES, *supra* note 42, at 4.

[55] The FAA carries on the same responsibilities even after its move from the Department of Commerce to the Department of Transportation. *See History,* FED. AVIATION ADMIN., http://www.faa.gov/about/history/brief_history/ (last visited Nov. 11, 2010).

the insurance industry."[56] With time, these safety measures decreased the number of crashes among private and passenger aircraft, such that [b]etween 1930 and 1932, the fatality rate per 100 million passenger-miles declined by 50 percent."[57] But a succession of devastating accidents in the 1950s exposed a glaring need to improve the aviation safety regime.[58] This revelation prompted Congress to enact the Federal Aviation Act of 1958, which established the Federal Aviation Agency and "provide[d] for the regulation and promotion of civil aviation in such a manner as to best foster its development and safety, and to provide for the safe and efficient use of the airspace by both civil and military aircraft."[59]

[18] The Federal Aviation Act of 1958 granted the Federal Aviation Agency a wide range of powers relating to the regulation of United States airspace, including the authority to: further the development of domestic and foreign air commerce; create a framework for the use of airspace; and formulate rules and regulations regarding the practices, standards and procedures of airspace use, and the materials, construction and standards of aircraft designs.[60] From its inception, the agency grew rapidly, increasing by 10,000 employees between 1959 and 1961.[61] In 1966, Congress enacted the Department of Transportation Act, which transitioned agency oversight to the Department of Transportation and

[56] WELLS & RODRIGUES, *supra* note 42, at 4.

[57] *Id*. at 5.

[58] Paul Stephen Dempsey, *Independence of Aviation Safety Investigation Authorities: Keeping the Foxes from the Henhouse*, 75 J. AIR L. & COM. 223, 263 (2010). The events triggering the enactment of the Federal Aviation Act of 1958 included a 1956 mid-air collision over the Grand Canyon, a 1957 mid-air collision over California, and a 1958 mid-air collision over an area close to Las Vegas, Nevada. *Id*.

[59] Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731.

[60] *See id*. at §§ 305, 307(a)-(c), 312(a), 316.

[61] *See* WELLS & RODRIGUES, *supra* note 42, at 8.

renamed the Federal Aviation Agency the Federal Aviation Administration.[62]

[19] The history of the FAA also involves overregulation and, more recently, evidence of agency capture.[63] Before 1978, the government dictated permissible air routes and ticket prices.[64] The Airline Deregulation Act of 1978 – authorized amidst congressional speculation that deregulation would lead to a decrease in the cost of air fares – changed that standard.[65] The New York Times aptly described the Airline Deregulation Act as the government's transformation of "air travel into mass transportation."[66] By 2000, airlines carried three times as many passengers at rates forty percent lower than the fares airlines charged in the late 1970s.[67]

[20] But while industry deregulation blew open the door for air travel, economic growth created problems for air traffic controllers trying to keep up with increased demand.[68] Because there are a limited number of

[62] Department of Transportation Act, Pub. L. No. 89-670, 80 Stat. 931, § 3(e)(1)-(2) (1966); *see* WELLS & RODRIGUES, *supra* note 42, at 8.

[63] *See* Mark C. Niles, *On the Hijacking of Agencies (and Airplanes): The Federal Aviation Administration, "Agency Capture," and Airline Security*, 10 AM. U. J. GENDER SOC. POL'Y & L. 381, 405-09 (2002). "Capture theory is based on the notion that proper public focus of governmental agencies can be effectively distracted by the private interests of regulated entities." *Id*. at 392.

[64] *See* WELLS & RODRIGUES, *supra* note 42, at 9.

[65] *See* Airline Deregulation Act of 1978, Pub. L. No. 95-504, 92 Stat. 1705; WELLS & RODRIGUES, *supra* note 41, at 9.

[66] *Id*.

[67] *See* Laurence Zuckerman & Matthew L. Wald, *GRIDLOCK IN THE SKIES: A Special Report.; Crisis for Air Traffic System: More Passengers, More Delays*, N.Y. TIMES, Sept. 5, 2000, at A1, *available at http://query.nytimes.com/gst/fullpage.html?res=9500E0DE1F30F936A3575AC0A9669C8B63&scp=1&sq=zuckerman%20gridlock&st=cse*.

[68] *See generally id*.

suitable areas for air traffic facilities and a limited number of usable air traffic routes, it is inevitable that the increasing demand resulting from economic growth will far exceed supply.[69] As a congressional blue-ribbon panel noted, "[t]he [FAA] currently lacks the organizational, management, and financial wherewithal to keep pace with the dynamic aviation community."[70] Commentators also have suggested the FAA's dual mandate of "the protection of airline safety on one hand, and the 'fostering' of successful air commerce . . . on the other" has caused problems leading to agency capture,[71] and at least one commentator has suggested agency capture might have contributed to the September 11, 2001 attacks.[72]

B. NASA – The New Consumer of Commercial Space Technology

[21] While the impending birth of the commercial space market has prompted the need for a regulatory or liability scheme to govern the industry, recent developments have only made the need more pressing. In an April 2010 speech, President Barack Obama encouraged private companies to pursue innovations that will benefit the United States' space program.[73] Prior to this speech, the President, in a February 2010 budget request, proposed the cancellation of the Constellation program, which intended to return astronauts to the moon, and looked to private companies to supply spacecraft for the government.[74] Notably, this includes a call for

[69] *See generally id*.

[70] NAT'L CIVIL AVIATION REVIEW COMM'N, AVOIDING AVIATION GRIDLOCK: A CONSENSUS FOR CHANGE (1997), *available at* http://www.avweb.com/other/ncarcrpt/ncarcrpt.pdf.

[71] *See* Niles, *supra* note 63, at 407.

[72] *See id*. at 410-12.

[73] Kenneth Chang, *In Call to Alter NASA, Obama Vows Renewed Space Program*, N.Y. TIMES, Apr. 16, 2010, at A18.

[74] *Id*.

the private sector to develop spacecraft "for carrying astronauts to the International Space Station."[75]

[22] While the President claimed he was "100 percent committed to the mission of NASA and its future," critics began to take aim at the new plan.[76] Former astronauts Neil Armstrong, Jim Lovell and Eugene Cernan stated in a letter that President Obama's budget for NASA was "devastating" to the country's space program, and that "[w]ithout the skill and experience that actual spacecraft operation provides, the [United States] is far too likely to be on a long downward slide to mediocrity."[77] Others, such as Alabama Senator Richard C. Shelby, whose state had the chief design contract for the Constellation program, called President Obama's plans to encourage development of commercial spacecraft "'a welfare program for the commercial space industry.'"[78] Other members of Congress have introduced legislation intended to keep the space shuttles out of retirement.[79]

[23] However, the commercial space industry has already begun filling the void left in the wake of President Obama's announcement to scale back NASA. In June 2010, Space Exploration Technologies Corporation ("SpaceX") launched the first private rocket, which ultimately could take astronauts into orbit.[80] The Falcon 9 rocket, measuring in at 154-feet, 735,000 pounds, burned for nine minutes before reaching its 155 miles

[75] *Id*.

[76] Sandra Frederick, *Uncertain Launch for Obama's Space Mission, Critics Hit Change in Emphasis*, THE WASH. TIMES, Apr. 16, 2010, at A3.

[77] Letter from Neil Armstrong, Commander, Apollo 11, et al., (Apr. 2010) *available at* http://www.msnbc.msn.com/ id/36470363/ns/nightly_news.

[78] Kenneth Chang, *Obama's NASA Blueprint Is Challenged in Congress,* N.Y. TIMES, Apr. 23, 2010, at A16 (quoting Sen. Richard C. Shelby).

[79] *Id*.

[80] Kenneth Chang, *Private Rocket's First Flight Is a Success*, N.Y. TIMES, June 5, 2010, at A11.

target orbit.[81] Despite SpaceX claims that the launch was a success, others question the effectiveness of using the private sector to develop the country's space program.

[24] Texas Senator Kay Bailey Hutchison, who represents the home-state of NASA, noted that "'[e]ven this modest success is more than a year behind schedule, and the project deadlines of other private space companies continue to slip as well.'"[82] Others urge that the private sector should serve to supplement NASA's space flight program and not replace it entirely.[83] Regardless, SpaceX stated that with the aid of a government contract it would need only three years to develop a Falcon 9 rocket capable of taking American astronauts into orbit.[84]

[25] One commentator has recently compared the privatization of the space industry with the beginnings of the airlines and the enactment of the Kelly Airmail Act, which gave the U.S. Postal Service the chance to subcontract mail delivery with commercial airlines.[85] The Kelly Airmail Act, coupled with the measures previously discussed in Part II.A, allowed the commercial airlines to expand their routes, which helped lead to the commercial airline system we know today.[86] But the underlying problem remains the same: how to encourage the development of new technologies intended to expand the potential of the commercial market while ensuring the safety for all those involved. As stated in a recent edition of *Washington Monthly*, "NASA is gambling that private corporations, some of them as yet untested in spaceflight, can carry astronauts to the space station more safely than the space shuttle, even as the agency exercises

[81] *Id*.

[82] *Id*. (quoting Senator Kay Bailey Hutchison).

[83] *Id*.

[84] *Id*.

[85] Charles Homans, *The Wealth of Constellations: Can the Free Market Save the Space Program?*, WASH. MONTHLY, May 1, 2010, at 18(9).

[86] *Id*.; *see supra* Part I.A.

less safety oversight over them – a plan that runs counter to the recommendations of every major accident investigation NASA has conducted."[87] NASA administrator Charles Bolden Jr. has emphasized that safety remains a priority at NASA and the same safety standards set forth by NASA itself would apply to the private sector's attempts to fill NASA's needs.[88] In response, Senator Richard Shelby of Alabama claimed, "'[t]hat's not the message that's being received at NASA right now.'"[89]

[26] Still, if past attempts by private enterprises to use NASA facilities can serve as an example, the quest for safety could drive the best of the private sector out of the public space contracting business.[90] Starfighters, Inc. was the first commercial provider to use the Kennedy Space Center's Shuttle Landing Facility in Florida, where it houses four F-104 jets on the premises.[91] The corporation offers the public suborbital flight training and provides the government with the opportunity to perform microgravity experiments.[92] But Starfighters, Inc. spent two-years before it gained NASA's permission to use the facility.[93] Corporation President and Chief Pilot Rick Svetkoff stated, "'It nearly put us out of business. . . . Going in as the first, it was extremely difficult. We went through a lot of hurdles.'"[94] Svetkoff believes the reason behind the difficulties lies in

[87] Homans, *supra* note 85.

[88] Mary Orndorff, *Shelby Confronts NASA Chief on Leadership*, BIRMINGHAM NEWS (ALA.), Apr. 23, 2010, at 3.

[89] *Id*.

[90] *Wanted: New Partners*, FLORIDA TODAY (MELBOURNE, FLA.), Apr. 18, 2010, at E1.

[91] *Id*.

[92] *Id*.

[93] *Id*.

[94] *Id*. (quoting Rick Svetkoff, President and Chief Pilot, Starfighters, Inc.).

NASA's inexperience in dealing with the private market.[95] As he stated, "'[NASA is] not commercially oriented."[96]

[27] Thus, while NASA tries to maintain its commitment to safety when dealing with the private sector, the mandatory dealing with private space flight companies of President Obama's plan might jeopardize NASA's safety regulations. Using the airline industry as an example, NASA's primary focus on safety will begin to bend in favor of deregulation and more flexibility in dealings with the commercial market. Thus, the agency with the expertise and knowledge to properly regulate the commercial space travel market at this early stage will have to favor the private market in its dealings. Yet, the airline industry has already faced this reality, as it routinely deals with the problems associated with the dual mandate of the FAA and the potential for agency capture.

C. The Current State of Regulation in Commercial Space Travel and Potential Agency Capture

[28] Court confidence in agency expertise began to waver during the 1960s and 1970s.[97] Around the same time, academia identified agency capture as a cause of the growing skepticism surrounding agency expertise.[98] The theory of agency capture suggests "that agencies go through a natural 'life cycle,'" wherein the early phases of an agency's existence are "characterized by vigorous and independent regulation, not unlike the role for agencies imagined by the public interest literature," but the later phases are "closely identified with and dependent upon the industry it is charged with regulating."[99]

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[95] *Wanted: New Partners*, FLORIDA TODAY (MELBOURNE, FLA.), Apr. 18, 2010, at E1.

[96] *Id*. (quoting Rick Svetkoff, President and Chief Pilot, Starfighters, Inc.).

[97] *See* Thomas W. Merrill, *Capture Theory and the Courts: 1967-1983,* 72 CHI.-KENT L. REV. 1039, 1060 (1997).

[98] *Id*.

[99] *Id*. (citing MARVER H. BERNSTEIN, REGULATING BUSINESS BY INDEPENDENT COMMISSION (1955)).

[29] The D.C. Circuit addressed this issue in *Home Box Office, Inc v. FCC*, in which the court considered *ex parte* communications between cable providers and the FCC.[100] The court stated:

> Although it is impossible to draw any firm conclusions about the effect of *ex parte* presentations upon the ultimate shape of the pay cable rules, the evidence is certainly consistent with often-voiced claims of undue industry influence over Commission proceedings, and we are particularly concerned that the final shaping of the rules we are reviewing here may have been by compromise among the contending industry forces, rather than by exercise of the independent discretion in the public interest the Communications Act vests in individual commissioners.[101]

[30] During the early 1980s, judicial thought shifted from agency capture toward a new operational method known as the "public choice theory."[102] This theory is premised on the idea that agencies no longer operate as instruments of the industries they regulate, rather they act in their own interests to preserve their continued existence.[103] Under either theory – agency capture or public choice – the agency premises its action on the survival of the industry it serves. For example, the FAA makes safety approval determinations related to commercial space travel according to "performance-based criteria, against which [it] may assess the effect on public health and safety and on safety of property, in the following hierarchy: (1) FAA or other appropriate Federal regulations[;] (2) Government-developed or adopted standards[;] (3) Industry consensus performance-based criteria or standard[;] (4) Applicant-developed

[100] *See generally* Home Box Office, Inc. v. FCC, 567 F.2d 9 (D.C. Cir. 1977).

[101] *Id*. at 53.

[102] *See* Merrill, *supra* note 97, at 1068-69.

[103] *See id*. at 1068-71.

criteria."[104] The applicant-developed criteria category allows the manufacturer to define its own performance standards based on four factors, and is the last category to which the FAA will look.[105]

[31] The development of the airline industry demonstrates that deregulation can prove "one of the government's most successful economic initiatives."[106] Limited regulation in the early days of commercial aviation developed the industry into what we know today and, as discussed earlier, made airlines a realistic mode of transportation for nearly all American citizens.[107] In the realm of space travel, similar limits on regulation will likely grant companies developing technologies significant leeway for innovative discovery and manufacturing, while providing the FAA and AST a final say on safety. This allows the FAA and AST to meet its dual mandate to:

> [E]ncourage private sector launches, reentries, and associated services and, only to the extent necessary, regulate those launches, reentries, and services to ensure compliance with international obligations of the United States and to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States.[108]

[32] The problem occurs when FAA and AST regulations become a means by which developing industries push the envelope at the expense of safety. American University Professor of Law Mark C. Niles considers this problem in his paper addressing potential agency capture within the

[104] 14 C.F.R. § 414.19 (2010).

[105] *See id*.

[106] *See* Zuckerman & Wald, *supra* note 67.

[107] *See infra* Part II.A.

[108] 49 U.S.C. § 70101(a)(7) (2006).

FAA leading up to the September 11, 2001 attacks.[109] Niles suggests the FAA suffered from agency capture at the time of the attacks,[110] and notes that the dual mandate to promote aviation and provide for its safety creates inconsistent goals.[111] As another commentator observed, "[t]hese conflicting purposes are an obvious problem once one realizes that for every proposed safety regulation, the FAA must weigh the cost of implementation and determine if it is worth the financial strain on the airlines."[112] According to Niles, this framework led to individual airlines implementing passenger safety regulations, rather than airports or the FAA.[113] While Niles does not believe there is enough evidence to show the FAA has succumbed to agency capture, he concludes "that effective regulation within the airline industry in promotion of the public interest is less of a priority for the FAA than ensuring that the industry be provided with an atmosphere where it can thrive financially."[114] Thus, Niles believes, "The FAA demonstrates all the signs of an agency that has allowed private pressure to undermine its public responsibility, and its regulations are tragically deficient as a result."[115]

[33] An analysis of agency capture and any similar acquiescence by the FAA and AST to the private pressures of the commercial space travel

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[109] *See generally* Niles, *supra* note 63, at 413.

[110] *Cf. id.* at 406 ("[T]he FAA has consistently promoted the interests of the airline industry at the expense of the broader public interest, including airline safety and security.").

[111] *Id.* at 412-16.

[112] Lea Ann Carlisle, Comment, *The FAA v. the NTSB: Now That Congress Has Addressed the Federal Aviation Administration's "Dual Mandate," Has the FAA Begun Living up to Its Amended Purpose of Making Air Travel Safer, or Is the National Transportation Safety Board Still Doing Its Job Alone?*, 66 J. AIR L. & COM. 741, 741 (2001)); *see also* Niles, *supra* note 63, at 413-16.

[113] *See id.* at 426-27 (citing 49 U.S.C. § 44903(c)(2)(B) (1994)).

[114] *Id.* at 422.

[115] Niles, *supra* note 63, at 442.

industry is beyond the scope of this Article. However, it is clear that giving an industry such a powerful say in regulations affecting the development of the space travel industry development may result in disastrous consequences. Importantly, the FAA and the AST have yet to face these issues in the emerging space flight industry.[116] As such, the FAA and AST have an opportunity to ensure the space flight industry does not fall into the same passenger safety trap as commercial airlines.[117] Time to change these ineffective policies and attitudes runs short, however, as Virgin Galactic makes plans to begin commercial space flights within the next year.[118] While safety remains a primary concern, the FAA and AST must also follow their mandate to encourage the development of this exciting industry,[119] which means supporting Virgin Galactic's efforts to launch its services in 2011.[120]

[34] One way to deal with the inherent conflict between safety regulation and industry development involves the FAA and AST working with the commercial space industry to reach a solution at the onset of the industry. But this solution provides a less than satisfactory guarantee of safety to passengers who rely on the FAA and AST's mandate "to protect . . . public health and safety."[121] Furthermore, such a solution makes it harder for passengers to bring a claim against providers like Virgin

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[116] *Cf.* Cheryl Pellerin, *U.S. Agencies, Companies Work to Commercialize Space Travel, Business Growing for Spaceports, Commercial Launches, Space Station Flights*, AMERICA.GOV (May 29, 2009), http://www.america.gov/st/scitech-english/2009/May/20090529163746lcnirellep0.2032587.html (discussing the recent evolution of the industry and acknowledging that the AST has issued just 196 licenses for launch since the office's inception more than 20 years ago).

[117] *See generally* Niles, *supra* note 63, at 413.

[118] *See* Norris, *supra* note 3.

[119] *See* 49 U.S.C. § 70101(a)(7) (2006);

[120] Norris, *supra* note 3.

[121] *See* 49 U.S.C. § 70101(a)(7) (2006); Pellerin, *supra* note 114 (noting that the AST must seek "to ensure public safety during commercial launch and re-entry activities.").

Galactic if something goes wrong.[122] In essence, giving the commercial space flight industry the ability to regulate itself means consumers will have a difficult road making claims against operators in the industry. Under these circumstances, the commercial space flight industry has no incentive to maintain safety from the outset or, for that matter, in the future.

[35] Thus, Congress and the courts must ensure the safety of the passengers from the outset of this industry and prevent the FAA and AST from falling victim to agency capture through the creation of a legal regime, a concept that is not new, to deal with extraordinary circumstances.[123] Consider the establishment of maritime law and the Longshore and Harbor Workers' Compensation Act.[124] The act stated that the provided remedies "shall be exclusive and in place of all other liability of such employer to the employee,"[125] and intended to provide uniformity regarding incidents on the many different state shores across the country.[126] Accordingly, the law applies uniformly across state and federal courts.[127]

[36] The United States Supreme Court holds that if a plaintiff experiences an injury on board a ship in navigable waters, "[t]he legal rights and liabilities arising from that conduct [are] within the full reach of the admiralty jurisdiction and [measured] by the standards of [federal]

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[122] *See d*iscussion *infra* Parts III-V.

[123] *See* U.S. CONST. art. I, § 8, cl. 18.

[124] Longshore and Harbor Workers' Compensation Act, Pub. L. No. 69-803, 44 Stat. 1424 (1927) (codified as amended at 33 U.S.C. §§ 901-50 (2006)).

[125] 33 U.S.C. § 905(a) (2006).

[126] *See* Hetzel v. Bethlehem Steel Corp., 50 F.3d 360, 364 (5th Cir. 1995) (citing S. Pac. Co. v. Jensen, 244 U.S. 205 (1917)).

[127] *See, e.g.*, *id.* (citing State Indus. Comm'n v. Nordenholt Corp., 259 U.S. 263, 274-76 (1922)).

maritime law."[128] The Court applies this "'reverse-*Erie*' doctrine" to personal maritime actions.[129] As such, while state courts may still hear these cases, they must apply federal law.[130]

[37] The Court should apply a similar doctrine to the commercial space travel industry. Such a doctrine would ensure uniformity on an issue that spans around the globe. Furthermore, because the United States will soon face liability for spaceships taking off from its soil, liability in space travel will be a federal issue with state common law themes.[131] To ensure uniformity, Congress must devise an acceptable liability scheme before allowing spaceships to take flight. To accomplish this goal, the United States should adopt a solution similar to the novel approach Pennsylvania courts use in products liability law as applied to amusement park operators.[132] The need to implement this solution becomes apparent after considering alternative methods for bringing claims against companies such as Virgin Galactic.

III. THEORIES OF LIABILITY BASED ON INTERNATIONAL TREATIES

A. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon, and Other Celestial Bodies

[38] The United States and eighty-three other countries entered into a treaty concerning space travel less than two years before Neil Armstrong

[128] Kermarec v. Compagnie, 358 U.S. 625, 628 (1959).

[129] Offshore Logistics v. Tallentire, 477 U.S. 207, 223 (1986) (citing William F. Baxter, *Choice of Law and the Federal System*, 16 STAN. L. REV. 1, 34 (1963)).

[130] *See Kermarec*, 358 U.S. at 628.

[131] *See infra* Part III.

[132] *See infra* Part VI. *See generally* Francioni v. Gibsonia Truck Corp., 372 A.2d 736, 739 (Pa. 1977).

walked on the moon in July 1969.[133] The rationale behind the treaty was to "reduce the danger of conflict in space."[134] As the Secretary-General of the United Nations stated in a message directed to the major superpowers, "[a]s man ventures into space, he cannot rely solely on his scientific and technological knowledge, great as it may be. He must equally depend on legally binding universal standards of conduct, progressively developed as science unravels the mysteries of space."[135]

[39] The Treaty does not deal solely with military issues, but also assesses liability on an international scale for all objects launched into space.[136] In particular, article VII states:

> Each State Party to the Treaty that launches or procures the launching of an object into outer space, including the moon and other celestial bodies, and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such object or its component parts on the Earth, in air space or in outer space, including the moon and other celestial bodies.[137]

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[133] *See generally* Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, *opened for signature* Jan. 27, 1967, 18 U.S.T. 2410 (entered into force Oct. 27, 1967) [hereinafter Treaty]; Press Release, Secretary-General, Message Sent to President Lyndon B. Johnson, Premier Aleksei N. Kosygin, and Prime Minister Harold Wilson on the Occasion of the Signing of the Treaty of Principles Governing the Activities of States in the Exploration and Use of Other Space, including the Moon and Other Celestial Bodies, U.N. Press Release SG/SM/646 (Jan. 27, 1967), *reprinted in* 7 PUBLIC PAPERS OF THE SECRETARIES-GENERAL OF THE UNITED NATIONS, 1965-1967, at 374 (Andrew W. Cordier & Max Harrelson eds., 1976) [hereinafter Message].

[134] *See* Message, *supra* note 133, at 375.

[135] *Id*.

[136] *See generally* Treaty, *supra* note 133, at art. VIII.

[137] *Id*. at art. VII.

[40] As such, under this treaty, the United States faces potential liability for anything that goes wrong with a commercial space flight taking off from United States territory. This not only includes falling pieces of debris landing in foreign countries, but injury to foreign nationals resulting from the spacecraft's presence in air space or outer space.[138] The potential for such liability has led to the requirement that operations must buy $500 million in third-party liability insurance with the government responsible for up to $1.5 billion for remaining damages.[139]

[41] Notably, the Treaty further mandates that "[a] State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."[140] As a result, the D.C. Circuit Court recognized that, while the Treaty does not expressly address tort claims, "the basic principle is that in the sovereignless reaches of outer space, each state party to the treaty will retain jurisdiction over its own objects and persons."[141] Thus, United States law controls issues of liability for accidents occurring during space flights from the United States, including Virgin Galactic flights from Spaceport America. This empowers Congress and the courts to ensure the liability standards for commercial space travel remain fair and equitable.

B. The Warsaw Convention, Montreal Accord, and Montreal Protocols

[42] Under the Warsaw Convention the international community agreed to regulate "all international transportation of persons, baggage, or goods

[138] *Id*.

[139] *See* Ryabinkin, *supra* note 37, at 120.

[140] Treaty, *supra* note 133, at art. VIII.

[141] Beattie v. United States, 756 F.2d 91, 100 (D.C. Cir. 1984) (citing Treaty, *supra* note 131, at art. VIII). The Tax Court also acknowledged in dicta that no state has sovereignty over outer space. *See* Rogers v. Comm'r, 97 T.C.M. (CCH) 1573, 1573 n.13 (T.C. 2009). The court noted, "[I]ncome earned in outer space would not be considered foreign earned income. . . . For Federal income tax purposes, income earned in outer space would be treated just like income earned in international waters or in international airspace." *Id*.

performed by aircraft for hire."[142] The Warsaw Convention, as modified by the Montreal Accord of 1966 and the Montreal Protocols,[143] governs the scope of air carrier liability for injuries to passengers or damage to luggage.[144] The original language of the Warsaw Convention caps the liability of an air carrier, which the Montreal Accord set at $75,000,[145] unless "the damage is caused by [its] wilful [sic] misconduct or by such default on [its] part as, in accordance with the law of the Court to which the case is submitted, is considered to be equivalent to wilful [sic] misconduct."[146] In light of the liability cap, the necessary standard to circumvent the cap and the overall forgiving nature of the Warsaw Convention, it is apparent that "the Warsaw Convention and initial lack of domestic regulation provided the U.S. airline industry with the combination of protection and freedom it needed to flourish."[147] However, does the Warsaw Convention provide the appropriate liability scheme for

[142] *See generally* Convention for the Unification of Certain Rules Relating to International Transportation by Air art. 1, § 1, Oct. 12, 1929, 49 Stat. 3000, T.S. No. 876 [hereinafter Warsaw Convention].

[143] *See* Liability Limitations of Warsaw Convention and Hague Protocol, Order Approving Agreement, 31 Fed. Reg. 7302, 7302 (May 19, 1966); Additional Protocol No. 4 to Amend the Convention for the Unification of Certain Rules Relating to International Carriage by Air, Sept. 25, 1975, 2145 U.N.T.S. 36 [hereinafter Montreal Protocol No. 4]; LAWRENCE B. GOLDHIRSCH, THE WARSAW CONVENTION ANNOTATED: A LEGAL HANDBOOK 7-8 (2000). The Warsaw Convention was also modified by other international agreements, such as the Hague Protocol (1955), which the United States never ratified, but subsequently adopted after agreeing to the Montreal Protocol No. 4, and the Guatemala City Protocol (1971). *See* GOLDHIRSCH at 6.

[144] *See generally* Warsaw Convention, *supra* note 142.

[145] *See* Liability Limitations of Warsaw Convention, *supra* note 143; Byrd v. Comair, Inc. (*In re* air Crash at Lexington, Ky., Aug. 27, 2006), 501 F. Supp. 2d 902, 908-13 (E.D. Ky. 2007) (citing *In re* Air Disaster at Lockerbie, Scot. On Dec. 21, 1988), 928 F.2d 1267, 1270 n.2 (2d Cir. 1991).

[146] Warsaw Convention, *supra* note 142, at ch. 25; *see also* El Al Isr. Airlines, Ltd. v. Tseng, 525 U.S. 151, 166-67 (1999)).

[147] Ryabinkin, *supra* note 38, at 105.

the commercial space flight industry?[148] Proper evaluation of this question begins with an analysis of the language governing the scope of the Warsaw Convention.

[43] Chapter I of the Warsaw Convention states, "[t]his convention shall apply to all international transportation of persons, baggage, or goods performed by aircraft for hire. It shall apply equally to gratuitous transportation by aircraft performed by an air transportation enterprise."[149] The United States Code defines the term "aircraft" as "any contrivance invented, used, or designed to navigate, or fly in, the air."[150] Utilizing this broad definition of "aircraft," it appears the Warsaw Convention may apply to incidents arising from commercial space travel. After all, spaceships like SpaceShipTwo and WhiteKnightTwo "navigate, or fly in, the air," and therefore fit the Code's definition of "aircraft."[151] But it is the definition of "launch vehicle" – "a vehicle built to operate in, or place a payload or human beings in, outer space; and . . . a suborbital rocket," that applies more directly to crafts such as SpaceShipTwo and WhiteKnightTwo.[152] Therefore, a court is more likely to classify SpaceShipTwo and WhiteKnightTwo as "launch vehicles," rather than "aircraft[s]."

[44] The text of the Warsaw Convention considered the idea of "experimental trial" aircraft.[153] In doing so, it stated:

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[148] At least one commentator chose not to apply the Warsaw Convention liability scheme to commercial space travel. *See generally* Ryabinkin, *supra* note 38, at 106-07.

[149] Warsaw Convention, *supra* note 142, at art. 1.

[150] 49 U.S.C. § 40102(a)(6) (2006). It is of note that the United States adopted this definition well before the enactment of the Warsaw Convention. *See generally id*.

[151] *See id*; Norris, *supra* note 3.

[152] *Id*. § 70102(8)(A)-(B) (2006).

[153] *See* Warsaw Convention, *supra* note 142, at art. 34.

> This convention shall not apply to international transportation by air performed by way of experimental trial by air navigation enterprises with the view to the establishment of regular lines of air navigation, nor shall it apply to transportation performed in extraordinary circumstances outside the normal scope of an air carrier's business.[154]

[45] Although it is unlikely the signatory nations considered commercialized space travel, Virgin Galactic's WhiteKnightTwo and SpaceShipTwo might fall under the Convention's definition of experimental trial.[155] If so, other commercial space travel operations could arguably fit as well, and regardless of the signatories' actual intent, a court would likely characterize the commercial space industry as "experimental."[156] If courts draw this conclusion, industry participants, from passengers to carriers, face potentially limitless liability since the Convention would not apply in a commercial space industry case.[157] Therefore, Congress must adopt the *Francioni* products liability scheme.[158]

IV. NEGLIGENCE – WHAT IS THE DUTY? WHERE'S THE CAUSE?

[46] Since negligence is primarily a state law concept, negligence claims brought in federal courts are generally adjudicated under state law.[159] Thus, while the Warsaw Convention gives the federal judiciary

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[154] *Id*.

[155] *See* Warsaw Convention, *supra* note 142, at art. 34

[156] "Experimental" means "pertaining to, derived from or founded on experiment." RANDOM HOUSE UNABRIDGED DICTIONARY 681 (2d ed. 1993). "Experiment" means "a test, trial, or tentative procedure; an act or operation for the purpose of discovering something unknown." *Id*.

[157] *See* Warsaw Convention, *supra* note 142, at art. 34

[158] *See infra* Part VI.

[159] *See* Erie R.R. v. Tompkins, 304 U.S. 64, 78 (1938).

jurisdiction,[160] the *Erie* doctrine requires that the federal courts apply the appropriate state law concerning common law negligence.[161] But the *Erie* doctrine's restriction on federal courts does not apply "in matters governed by the Federal Constitution or by Acts of Congress."[162] As a result, federal common law still exists today.[163] Congress should act now to define a workable liability scheme that ensures uniformity for space travel liability issues before the fifty states set up their own regimes.

[47] As previously stated, the federal courts could impose a "reverse-*Erie*" doctrine allowing the cases to go forward in state courts, which arguably are better suited to handle this style of case, while Congress and the federal courts establish the law in light of its national and international implications. Given the law's present state, this Article looks to New Mexico law, since it appears this state will be the first to deal with these extraordinary concepts.

[48] New Mexico law specifically allows a plaintiff to bring a design defect claim in both strict liability and negligence.[164] The New Mexico Supreme Court has established the elements of negligence as follows:

> Generally, a negligence claim requires the existence of a duty from a defendant to a plaintiff, breach of that duty, which is typically based upon a standard of reasonable care, and the breach being a proximate cause and cause in fact of the plaintiff's damages. 'In New

[160] *See* 28 U.S.C. §1331 (2006).

[161] *See* Zicherman v. Korean Air Lines Co., 516 U.S. 217, 229 (1996) ("Articles 17 and 24(2) provide nothing more than a pass-through, authorizing us to apply the law that would govern in absence of the Warsaw Convention.").

[162] *See id*.

[163] *See* Clearfield Trust Co. v. United States, 318 U.S. 363, 367 (1943) ("In absence of an applicable Act of Congress it is for the federal courts to fashion the governing rule of law according to their own standards.").

[164] Brooks v. Beech aircraft Corp., 902 P.2d 54, 56 (N.M. 1995).

> Mexico, negligence encompasses the concepts of foreseeability of harm to the person injured and of a duty of care toward that person.'[165]

[49] The court has held that while negligence is a question of fact for the jury, "a finding of negligence . . . is dependent upon the existence of a duty on the part of the defendant."[166] The existence of a duty is a question of law determined by the court.[167] Since a plaintiff will likely have little problem showing damages in a matter concerning a spaceship accident, but will face difficulty proving a duty exists in the first place and the breach caused the injuries, this Article will focus solely on duty and breach under New Mexico law.

A. Duty

[50] The question of duty in a negligent design of a defective product case is "a function of conscious choice, [because] design is conduct dependant."[168] As a result, a court's determination on whether a duty exists to design and manufacture a non-defective spaceship will look to the designer's actions and its knowledge at the time of design and production. To determine whether a duty exists, the New Mexico Supreme Court analyzes both foreseeability and policy before deciding whether the plaintiff owed a duty to the defendant.[169]

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[165] Herrera v. Quality Pontiac, 73 P.3d 181, 185-86 (N.M. 2003) (quoting Ramirez v. Armstrong, 673 P.2d 822, 825 (N.M. 1983)).

[166] *Id*. at 186 (quoting Schear v. Bd. of Cnty. Comm'rs, 687 P.2d 728, 729 (N.M. 1984)).

[167] *E.g*., *id*. (quoting *Schear*, 687 P.2d at 729).

[168] *Beech*, 902 P.2d at 59.

[169] *See Herrera*, 73 P.3d at 187 (quoting Madrid v. Lincoln Cnty. Med. Ctr., 909 P.2d 14, 20 (N.M. Ct. App. 1995).

1. Foreseeability

[51] When evaluating foreseeability, New Mexico courts ask "whether the defendant's conduct foreseeably created a broader 'zone of risk' that poses a general threat of harm to others."[170] This analysis differs from the causation prong. Foreseeability serves as a minimum threshold while the causation prong requires a much higher factual showing.[171] A plaintiff involved in a tragic accident would not have a hard time proving the foreseeability prong of the duty analysis. Thus, spaceship operators, like Virgin Galactic, and spaceship manufacturers, like The Spaceship Company,[172] may, under this analysis, create a larger "zone of risk" posing a general threat of harm to others.

[52] In response, a defendant could argue the danger was "open and obvious" thus limiting the "zone of risk."[173] The defendant could argue the plaintiff assumed an extremely broad "zone of risk" involved with climbing on-board experimental spaceships holding thousands of gallons of rocket-fuel. As a result, the "zone of risk" associated with such operations could not expand based on the defendant's conduct.

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[170] *Herrera*, 73 P.3d at 185-86 (quoting McCain v. Fla. Power Corp., 953 So.2d 500, 502 (Fla. 1992)); *see also* Calkins v. Cox Estates, 792 P.2d 36, 38 (N.M. 1990) ("[I]n determining duty, it must be determined that the injured party was a foreseeable plaintiff – that he was within the zone of danger created by respondent's actions . . . .").

[171] *See infra* note 195 and accompanying text.

[172] *About*, THE SPACESHIP COMPANY, *available at* http://www.thespaceshipcompany.com/About.html (last visited Nov. 13, 2010) (noting that "The Spaceship Company[] is a new aerospace production company, founded by Sir Richard Branson's Virgin Group and Scaled Composites, which will be building the world's first fleet of commercial spaceships . . . .[The Spaceschip Company] has contracted Scaled Composites to develop and build prototypes of [WhiteKnightTwo] and [SpaceShipTwo].").

[173] Klopp v. Wackenhut Corp., 824 P.2d 293, 295-97 (N.M. 1992) (rejecting the "open and obvious" rule, which holds that there is no duty where the danger is reasonably known to others).

[53] While some jurisdictions recognize the "open and obvious" doctrine as a defense,[174] the New Mexico Supreme Court firmly rejects it.[175] In dealing with slip-and-fall cases, the court held "an owner or occupier of a premises cannot avoid liability for injuries that are obvious, abolishing the doctrine that landowners incur no liability for hazards that are open and obvious."[176] Without "open and obvious" as a defense, the obligation of operators and manufacturers like Virgin Galactic and The Spaceship Company to build and design spaceships without defects passes the foreseeability prong, making this obligation a duty.

2. Public Policy

[54] When performing this analysis, the New Mexico Supreme Court first looks to whether the defendant owed the plaintiff a statutory duty.[177] As stated by the court, "'[w]ith deference always to constitutional principles, it is the particular domain of the [L]egislature, as the voice of the people, to make public policy.'"[178] For this reason, demonstrating a statutory duty may prove difficult for potential plaintiffs.

[55] The New Mexico legislature introduced a bill in 2009 that would grant conditional liability immunity for commercial space travel providers against "the inherent risks of space flight activities."[179] Incidentally, New Mexico is not alone in this view. In 2007, Virginia became the first state in the United States to enact legislation providing conditional immunity to

[174] *See, e.g.*, Michalski v. Home Depot, Inc., 225 F.3d 113, 122 (2d Cir. 2000); Theriot v. Bay Drilling Corp., 783 F.2d 527, 536 (5th Cir. 1986); McMahon v. Bunn-O-Matic Corp., No. 03:96-CV-538RP, 1997 WL 873829, at*10 (N.D. Ind. Nov. 10, 1997).

[175] *See* Benavidez v. City of Gallup, 161 P.3d 853, 859 (N.M. 2007).

[176] *Id*. (citing *Klopp*, 824 P.2d at 297).

[177] *See Herrera*, 73 P.3d at 187.

[178] *Id*. (quoting Torres v. State, 894 P.2d 386, 389 (N.M. 1995)).

[179] S.B. 37, 49th Leg., 1st Reg. Sess. (N.M. 2009).

commercial space flight providers.[180] Florida followed suit the next year, adopting the Spaceflight Informed Consent Act of 2008.[181]

[56] The Space Flight Liability and Immunity Act bounced around from the Senate Committee on Public Affairs to the Senate Committee on Judiciary and back to the Senate Committee on Public Affairs before passing the committee with no recommendation.[182] Still, the act sets forth the basic policies put before the Senate Floor of the New Mexico legislature. These policies acknowledge:

> A. . . . New Mexico and its residents will gain significant economic and personal benefits from the development of a successful and robust commercial human space flight industry, while playing a significant role in its growth. The development of the spaceport will create jobs and have a positive effect on the state's tax base; [and]
> B. [C]ommercial human space flight activities involve inherent risks that cannot be eliminated or controlled through the exercise of reasonable care and that justify the exculpation of ordinary negligence, and that these inherent risks provide the challenge and excitement that entice space flight participants to participate in these activities . . . .[183]

The Space Flight Liability and Immunity Act, then, would relieve the commercial space flight provider of liability, provided it acquires the passenger's informed consent and does not commit "an act or omission

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[180] *See* VA. CODE ANN. §§ 8.01-227.8-.10 (2009); Mineiro, *supra* note 134, at 382 (citing VA. CODE ANN. §§ 8.01-227.8-.10 (2009)).

[181] *See* FLA. STAT. ANN. § 331.401 (West 2009); Mineiro, *supra* note 134, at 382 (citing FLA. STAT. ANN. § 331.401 (West 2009)).

[182] *See* Bill Tracking Report, S.B. 37, 49th Leg., 1st Reg. Sess. (N.M. 2009), *available at* http://www.westlaw.com/ (search "Find this document by citation" for "2009 NM S.B. 37 (NS)"; then follow any of the hyperlinks returned).

[183] S.B. 37, 49th Leg., 1st Reg. Sess. (N.M. 2009).

that constitutes gross negligence evidencing willful or wanton disregard for the safety of a participant . . . or intentionally causes an injury."[184]

[57] While the act does not represent the law of New Mexico, it demonstrates the potential future state policy in light of the amount of economic incentives given to Spaceport America, which is located near the White Sands Missile Range in Southeast New Mexico.[185] The Spaceport Authority expects to complete construction of hangars, a terminal, and a 10,000-foot runway in 2010.[186] Because such projects are not cheap, in terms of money or state economic incentives, in 2006 the New Mexico legislature passed the Regional Spaceport District Act to provide economic incentives attracting Virgin Galactic and the developers of Spaceport America to the desert of Southern New Mexico.[187]

[58] The mission will require $198 million from taxpayers, $56 million of which will come from gross receipts tax increases in two neighboring counties over the next ten years.[188] To account for this the New Mexico Legislature placed three conditions upon the release of any state funding for the Spaceport America project.[189] First, the entire cost of the project must remain below $225 million.[190] Second, the Authority must secure an anchor tenant at Spaceport America.[191] Third, the Authority must obtain a signed launch license from the FAA.[192] The final pieces of the puzzle

[184] *Id*.

[185] *See* Rene Romo, *Spaceport Gets Its License to Launch: FAA Approval Clears Way for Construction to Begin*, ALBUQUERQUE J., at C1.

[186] *Id*.

[187] *See generally* H.B. 473, 47th Leg., 2d Reg. Sess. (N.M. 2006).

[188] Romo, *supra* note 185.

[189] *Id*.

[190] *See id*.

[191] *See id*.

[192] *See id*.

came together between late 2008 and early 2009 when Spaceport America obtained a license and Virgin Galactic signed a twenty-year lease with the state to use Spaceport America.[193] The project broke ground in June of 2009 and is now underway.[194]

[59] The policy behind all of this is clear. In much the same way that the dual mandate of the FAA and AST appear to conflict with safety, it seems apparent that New Mexico's investment into Spaceport America could conflict with Virgin Galactic and The Spaceship Company's duty to manufacture a safe product, especially with the amount of deference given to the legislature as policy setters. While this issue could go either way, it exposes the tenuous position facing plaintiffs when bringing negligence claims. These problems only intensify when considering the burden the plaintiff must meet to satisfy the causation element.

B. Proximate Cause

[60] The New Mexico Supreme Court defines proximate cause as "that which in a natural and continuous sequence [unbroken by an independent intervening cause] produces the injury, and without which the injury would not have occurred."[195] A plaintiff's case moves forward if a rational jury concludes that a breach of the duty established under the above analysis caused the plaintiff's injuries.[196] The main difficulty for a plaintiff's case, in the context of commercial space travel, surrounds the investigation of accidents involving spacecrafts. Typically, little, if anything, will remain after these accidents due to explosions or disintegrations upon re-entry into the Earth's atmosphere, as witnessed in the Challenger explosion in 1986 and Columbia's disintegration during re-

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[193] *See* Diana M. Alba, *Spaceport To Break Ground*, ALAMOGORDO DAILY NEWS (New Mexico), June 19, 2009, at NEWS.

[194] *See id*.

[195] *Herrera*, 73 P.3d at 195 (citing Uniform Jury Instructions, 13-305 NMRA 2003).

[196] *See id*.

entry in 2003.[197] While NASA possesses the resources to look into these issues, a typical plaintiff likely does not possess the financial means or scientific expertise to develop the evidence for the causation element.

[61] But all is not lost for the plaintiff. New Mexico law allows the plaintiff, in the absence of proof of specific negligent acts, to make a prima facie case of negligence based on a *res ipsa loquitor* theory.[198] To prove negligence through *res ipsa loquitor*, a plaintiff generally must show: "(1) that the accident be of the kind which ordinarily does not occur in the absence of someone's negligence; [and] (2) that it must be caused by an agency or instrumentality within the exclusive control and management of defendant."[199] With respect to claims stemming from commercial space travel, assuming a plaintiff would experience little difficulty showing accidents such as explosions or disintegrations would not have occurred absent manufacturer negligence, he may find it difficult to prove the defendant's exclusive control and management of the spacecraft. For example, a plaintiff would have a hard time showing The Spaceship Company has exclusive control of the spaceships because Virgin Galactic operates the crafts.[200] Conversely, it would be quite difficult to prove Virgin Galactic maintained exclusive control and management of spaceship operations because The Spaceship Company manufactures the vessels. As such, plaintiffs suing commercial space travel providers under a negligence theory in New Mexico state court must not only overcome the burden of proving a statutory duty, but the burden of proving the control and management element of res ipsa loquitor.

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[197] *See* John Noble Wilford, *With Fear and Wonder in Its Wake, Sputnik Lifted Us Into the Future*, N.Y. TIMES, Sept. 25, 2007, at F2, *available at* http://www.nytimes.com/2007/09/25/science/space/25sput.html; *see also infra* Part IV.C (discussing the efforts that went into finding the cause of the Columbia disaster).

[198] *See* Tafoya v. Las Cruces Coca-Cola Bottling Co., 278 P.2d 575, 577 (N.M. 1955).

[199] Renfro v. J.D. Coggins Co., 378 P.2d 130, 134 (N.M. 1963) (citing *Tafoya*, 278 P.2d at 577).

[200] *See* Eric Gershon, *Pratt to Power Civilian Spaceship Jet Engine Picked for Launch Aircraft*, Hartford Courant, July 12, 2007, at E1 ("Virgin Galactic will own and operate the aircraft.").

V. THE DIFFICULTIES IN PROVING STRICT LIABILITY

[62] Unfortunately, application of a strict liability theory does not make the road to recovery any easier. The New Mexico Supreme Court distinguishes strict liability and negligence as such: "Negligence focuses on *conduct*. Strict liability focuses on the *product*."[201] As a result, New Mexico courts distinguish between claims based on a product and claims based on a service,[202] and have held that "negligent services may trigger ordinary negligence, malpractice or breach of contract actions, but [they do] not form the basis for actions in strict liability."[203] This holding follows the majority rule for applying strict liability as recognized in other jurisdictions.[204] Analogizing the initial commercial space travel flights to amusement park rides demonstrates the difficulties associated with bringing a products liability claim.

[63] Applying this analogy, New Mexico would likely follow the majority of jurisdictions, holding commercial space travel "providers" as merely "provid[ing] persons with a service; namely a ride on a machine."[205] As a result, companies like Virgin Galactic and other providers of space "rides" would not face strict liability for a defective product.

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[201] Brooks v. Beech Aircraft Corp., 902 P.2d 54, 60 (N.M. 1995) (emphasis in original).

[202] *See, e.g.*, Trujillo v. Berry, 738 P.2d 1331, 1334 (N.M. Ct. App. 1987).

[203] *Id.*

[204] *See, e.g.*, Siciliano v. Capitol City Shows, Inc., 475 A.2d 19, 25 (N.H. 1984).

[205] *See id.*; *see also* Fellner v. Phila. Togboggan Coasters, Inc., No. 3:05-cv-218-SEB-WGH, 2006 U.S. Dist. LEXIS 53652, at *5 (S.D. Ind. Aug. 2, 2006) (citing Marsh v. Dixon, 707 N.E.2d 998, 1001-02 (Ind. Ct. App. 1999)); Sells v. Six Flags Over Tex., Inc., No. 3:96-CV-1574-D, 1997 U.S. Dist. LEXIS 23747, at *8-9 (N.D. Tex. Aug. 14, 1997); *Marsh*, 707 N.E.2d at 1001-02 (Ind. Ct. App. 1999).

[64] Under this legal framework the plaintiff could sue the manufacturer of the defective product, but not the provider of a service using the defective product.[206] The New Mexico Supreme Court explains:

> The policy underpinnings supporting imposition of strict liability on product manufacturers and suppliers include (1) ensuring that the risk of loss for injury resulting from defective products is borne by the suppliers, principally because they are in a position to absorb the loss by distributing it as a cost of doing business; (2) encouraging suppliers to select reputable and responsible manufacturers who generally design and construct safe products and who generally accept financial responsibility for injuries caused by their defective products ; and (3) promoting fairness by ensuring that plaintiffs injured by an unreasonably dangerous product are compensated for their injuries.[207]

This leaves plaintiffs with the daunting task of proving the spaceship's faulty design to maintain an action against the manufacturer for strict products liability.

[65] Proper distribution of the costs of operating business is a driving force behind the rule of products liability.[208] In essence, products liability acts as a form of insurance.[209] Manufacturers make their products understanding the possibility of defects and that no product is perfect.[210] As a result, the manufacturer increases the price of the product to pay for the product liability costs of inevitable accidents.[211] The New Mexico

[206] *See Trujillo*, 738 P.2d at 1334.

[207] Smith *ex rel*. Smith v. Bryco Arms, 33 P.3d 638, 644 (N.M. Ct. App. 2001) (citing *Brooks*, 902 P.2d at 57-58).

[208] *Brooks*, 902 P.2d at 60.

[209] *See id*.

[210] *See id*.

[211] *See id*.

Supreme Court recognized this cost-spreading rationale as a basis for adopting strict product liability for defective design, holding that "[a]s long as the price of a defective product line or successive product lines reflect some element of injury costs, the policy goal of cost distribution has been served."[212] While the New Mexico courts have yet to finely articulate the elements of a defective design claim, other states have defined the elements.[213]

[66] The Florida Supreme Court has held that:

> In order to hold a manufacturer liable on the theory of strict liability in tort, the user must establish [1] the manufacturer's relationship to the product in question, [2] the defect and unreasonably dangerous condition of the product, and [3] the existence of the proximate causal connection between such condition and the user's injuries or damages.[214]

These elements appear in line with the strict liability policies embraced by the New Mexico Supreme Court, and are therefore applied for the purposes of this Article's strict liability analysis, which uses the relationship between Virgin Galactic and The Spaceship Company as an example.

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[212] *Id*.

[213] *See infra* note 214 and accompanying text.

[214] West v. Caterpillar Tractor Co., 336 So. 2d 80, 87 (Fla. 1976); *see also* Smith v. Ariens Co., 377 N.E.2d 954, 958 (Mass. 1978) (listing the elements necessary under Massachusetts law for showing a design defect); Lamb v. B & B Amusements Corp., 869 P.2d 926, 929 (Utah 1993) (listing the elements necessary under Utah law for applying strict product liability to a defective product).

A. The Manufacturer's Relationship to the Product in Question

[67] A plaintiff's biggest problem in a potential suit against Virgin Galactic and The Spaceship Company lies in demonstrating individual manufacturer liability. The company closest to becoming the first to provide spaceflight service, in this case Virgin Galactic, operates more or less as both service provider and manufacturer of spaceships putting tourists in orbit, because the majority owner of Virgin Galactic holds a majority share in The Spaceship Company, which currently makes SpaceShipTwo and WhiteKnightTwo exclusively for Virgin Galactic.[215]

[68] In *Rodriguez v. Riddell Sports, Inc.*, the Fifth Circuit addressed the difficulty of holding a product's manufacturer liable when its parent company provides a service related to the product at issue.[216] In *Rodriguez*, the manufacturer of a football helmet did not include a new, safer type of foam inside the helmet.[217] The company responsible for reconditioning the helmet, which was part of the same parent company as the manufacturer, also did not include the new foam.[218] The plaintiff wore one of these helmets during a football game, and upon making his last tackle, he suffered an irreparable brain injury leaving him in a vegetative state.[219] The injured wearer and his mother subsequently sued the helmet manufacturer and its related companies.[220]

[69] The Fifth Circuit held that the company reconditioning the helmet provided a service and could not face strict liability unless it maintained control equating to the role of manufacturer.[221] The court also noted that

[215] *See id.*

[216] *See* Rodriguez v. Riddell Sports, Inc., 242 F.3d 567, 571 (5th Cir. 2001).

[217] *See id.*

[218] *See id.*

[219] *Id.*

[220] *See id.*

[221] *See Rodriguez*, 242 F.3d at 576.

the safer alternative, in this case the new foam, did not exist until well after the manufacturer made the helmet.[222] Furthermore, it stated, "if combining two corporations into one is necessary to apply a strict liability standard, then plaintiffs must prove that the corporations should be combined . . . ."[223] Thus, the plaintiff would have to pierce the corporate veil, an extremely unlikely proposition, before combining the defendants for purposes of applying strict liability to both the manufacturer and the provider.[224] The Fifth Circuit found that the lower court could not combine the defendants for purposes of litigation.[225]

[70] The plaintiff in any accident involving a trip aboard Virgin Galactic will face similar problems to those faced by the plaintiff in *Rodriguez*. The Spaceship Company manufactures the spaceship serviced and operated by Virgin Galactic. If new safety technology is developed after The Spaceship Company delivers the spaceships to Virgin Galactic and the spaceships are not upgraded, the plaintiff likely cannot combine the two obviously related companies in a lawsuit unless it can convince the court to pierce the corporate veil. *Rodriguez* exemplifies the difficulty of such a task. Furthermore, the plaintiff cannot allege strict liability against Virgin Galactic for the product defect since it was not the manufacturer and it did not sell the product specifically to the plaintiff.[226]

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[222] *Id*. at 574-75.

[223] *Id*. at 573.

[224] *See id*. Courts apply corporate veil doctrine less than half the time. *See* Robert B. Thompson, *Piercing the Corporate Veil: An Empirical Study*, 76 CORNELL L. REV. 1036, 1048 (1991) ("Courts pierced the veil in about 40% of reported cases.").

[225] *See Rodriguez*, 242 F.3d. at 573, 577.

[226] *See supra* IV.B (discussing proximate cause).

B. The Defect and Unreasonably Dangerous Condition of the Product

[71] New Mexico law also requires a determination of whether a product is unreasonably dangerous.[227] Courts use an "unreasonable risk of injury test" to determine whether a product is unreasonably dangerous.[228] "An unreasonable risk of injury is a risk which a reasonably prudent person having full knowledge of the risk would find unacceptable."[229] But presence of high risk is not dispositive of liability, as the jury must also calculate "whether the risk can be eliminated without seriously impairing the usefulness of the product or making it unduly expensive."[230] Jury instructions further emphasize this point because they "encourage a risk-benefit calculation by defining 'unreasonable risk of injury' in a way which requires the jury to balance meritorious choices for safety made by the manufacturer while minimizing the risk that the public will be deprived needlessly of beneficial products."[231]

[72] The spaceships made by The Spaceship Company present unique difficulties in applying the risk-benefit calculation.[232] Costs of manufacturing and maintaining the spaceships could easily skyrocket, driving down the risk-benefit calculation, and weakening the case that the product was unreasonably dangerous. Furthermore, additional costs associated with part repair or redesign could price the ships out of the market, especially considering each voyage already costs around $200,000.[233] While Virgin Galactic plans to bring launch frequencies up

[227] Smith v. Bryco Arms, 33 P.3d 638, 644 (N.M. Ct. App. 2001).

[228] *Id*. (citing Brooks v. Beech Aircraft Corp., 902 P.2d 54, 61 (N.M. 1995).

[229] *Id*. (citations omitted).

[230] *See id*. (citing *Brooks*, 902 P.2d at 61-63).

[231] *Id*. (citations omitted).

[232] *See generally Smith*, 33 P.3d 638.

[233] *See generally* Norris, *supra* note 3 (discussing the high cost of flights of Virgin Galactic's spaceships).

and costs down,[234] these changes will depend upon how soon voyages begin running.

[73] Personal interests of New Mexico residents in the spaceship launch may also influence juror risk-benefit analysis. As previously stated, at least 350 people have already invested nearly $40 million in deposits.[235] Virgin Galactic has also promised a free voyage annually (a $200,000 value) for one local resident from each county that approved taxes for the construction of Spaceport America.[236] Additionally, a New Mexico State University Report conservatively estimates the economic impact of these commercial space travel activities will be "$991.45 million, generating $296.62 million in earnings, and sustaining 2,284 jobs per year by the fifth year [of operation]," indicating meaningful economic revitalization for the state.[237] This money becomes even more important in a "state [facing a budget] shortfall of up to $500 million due to declining oil and natural gas tax revenue and a slowdown in consumer spending."[238] While these figures do not deal directly with the cost of designing a product not unreasonably dangerous, the numbers show that a significant amount of money is tied to the successful launch and longevity of the program. Needless to say, New Mexico has a stake in ensuring the program is a success. As such, New Mexico jurors utilizing this risk-benefit balancing test could find it very difficult to overlook its overall benefit to the community.[239]

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[234] *See id*.

[235] *See Park Avenue Travel*, *supra* note 19.

[236] *See* Diana M. Alba, *Virgin Galactic Sweetens Spaceport Deal Ahead of Tax Vote*, LAS CRUCES SUN-NEWS (New Mexico), Apr. 17, 2008, at NEWS.

[237] *See* ARROWHEAD CTR., N.M. STATE UNIV., BUSINESS PLAN FOR THE SOUTHWEST REGIONAL SPACEPORT 1 (2006), *available at* http://www.spaceportamerica.com/images/pdf/NMSU_Report.pdf.

[238] *See* Quigley Winthrop, *PRIVATE SECTOR'S NEW CHAMPION; Governor Takes Businessfriendly Record to Bigger Stage*, ALBUQUERQUE J., Dec. 7, 2008, at A1.

[239] *See Smith*, 33 P.3d at 644 (explaining how jurors balance the public's choices for safety while minimizing the risk of depriving individuals from beneficial products).

[74] Courts in other jurisdictions will allow the trier of fact to consider compliance with regulation standards in products liability cases, including those involving an airplane's compliance with FAA standards.[240] While FAA compliance does not provide a complete defense, "in a field as closely regulated as aircraft design and manufacture, it is proper to take into consideration . . . the fact that the regulatory agency has approved the very design of which they complain after considering the dangers involved."[241]

[75] The problem arises because the FAA has yet to determine precisely what type of safety restrictions apply to this new type of vehicle.[242] Creating further confusion is the fact that regulations specifically allow the FAA to consider suggestions from the manufacturer of the vehicle on allowable parameters for performance and safety.[243] In essence, the company developing the spaceship itself can define what classifies as a "defect."[244]

[76] As a result, the plaintiff will face extreme difficulties demonstrating the product as unreasonably dangerous under either theory. The cost of making the perfect spaceship at this late stage and the fact that the first trip into orbit only years away will prove too high for a jury required to balance economics and safety. Moreover, the industry's ability to set its own standards under FAA regulation will only further weaken potential product liability claims raised against The Spaceship Company.[245]

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[240] *See, e.g.*, Wilson v. Piper Aircraft Corp., 577 P.2d 1322, 1328 (Or. 1978).

[241] *See id.*

[242] *See supra* Parts II.A-B.

[243] *See* 14 C.F.R. § 414.19(a)(4) (2006) (identifying applicant-developed criteria as a factor the FAA may assess to determine whether to approve a safety feature).

[244] *See id.* § 414.19(a)(4).

[245] *See id.*

C. The Proximate Causal Connection

[77] The burden to demonstrate a defective product caused the injury is another challenge plaintiffs face in products liability suits. The magnitude of this difficulty becomes clear in light of the seven-month long investigation that followed the 2003 Space Shuttle Columbia disaster.[246] Over the course of this investigation more than 120 staff members and 400 NASA engineers deposed countless experts and reviewed more than 30,000 documents, and more than 25,000 searchers collected spacecraft debris from across the Western United States.[247] According to the Columbia Accident Investigation Board ("Board"), "[b]ecause the events that initiated the accident were not apparent for some time, the investigation's depth and breadth were unprecedented in NASA history."[248]

[78] The Board characterized the process to determine the "chain of circumstances" that caused the Columbia accident "particularly challenging."[249] It noted the importance of "[e]vidence . . . derived from film and video [images] of the launch, radar images of *Columbia* on orbit, and amateur video of debris shedding during the in-flight breakup . . . [as well as] sensors onboard the orbiter . . . [and] [a]nalysis of the debris."[250] In the end, the Board determined a piece of foam with the volume of 1200 cubic inches,[251] about the size of a large bag of hamster bedding,[252] hit

[246] *See* Mark Carreau, *Columbia Probe Continues for Some; Gehman, Handful of Others To Work on Appendices to Disaster Report,* HOUS. CHRON., Aug. 28, 2003, at A17.

[247] 1 COLUMBIA ACCIDENT INVESTIGATION BD., COLUMBIA ACCIDENT INVESTIGATION BOARD REPORT 9 (2003), *available at* http://caib.nasa.gov/news/report/pdf/vol1/full/caib_report_volume1.pdf.

[248] *Id*. at 11.

[249] *Id*.

[250] *Id*. at 49.

[251] *See id*. at 61.

Columbia less than a minute-and-a-half after launch, which breached the Thermal Protection System on the left wing and eventually caused the wing to fall apart during re-entry.[253]

[79] It is unlikely that a plaintiff who files suit against a space travel provider will have the necessary resources to determine whether a defect caused an accident. As indicated by the Columbia Accident Investigation Board Report, even a defect as small and insignificant as 1200 cubic inches material detaching from WhiteKnightTwo and hitting SpaceShipTwo, is enough to cause a devastating accident.[254] Furthermore, even if a plaintiff had the resources to utilize the expertise necessary to uncover the cause of space travel accidents, the passenger's, or the passenger's family's, ability to obtain data related to the cause of an accident during discovery would hinge on the record keeping practices of carriers like Virgin Galactic

VI. THE "AMUSEMENT PARK" APPROACH TO STRICT LIABILITY – THE *FRANCIONI* MODEL

[80] Neither the FAA/AST nor the courts applying negligence and product liability theories can ensure commercial space travel carriers and manufacturers of the spaceships will provide safe vehicles for passengers to lift-off into space. Thus, Congress must take action to establish a scheme to protect the public at-large.

[81] The enactment of strict liability schemes applicable to products or services not previously covered under the traditional approach is not a novel concept.[255] The Ohio legislature, for example, passed a statute

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[252] *See Kaytee Aspen Bedding 1,200 Cubic Inches*, ALL FERRET (Aug. 4, 2008), http://www.allferret.com/406/ kaytee-aspen-bedding-1200-cubic-inches/.

[253] *See* COLUMBIA ACCIDENT INVESTIGATION BD., *supra* note 247, at 49.

[254] *See supra* notes 247-51 and accompanying text.

[255] *See, e.g.*, State v. Buehler Food Mkts., Inc., 552 N.E.2d 680, 682 (Ohio Ct. App. 1989) (citing State v. Lisbon Sales Book Co., 200 N.E.2d 590,592 (Ohio 1964)).

requiring that food intended for sale be packaged according to appropriate weights and measures.[256] The Ohio Court of Appeals, which considered whether the legislature intended to impose strict liability despite the statute's silence on the matter, reasoned that "[t]he more serious the consequences are to the public, the more likely the legislature meant to impose liability without fault."[257]

[82] In the case of commercial space travel, the safety of the passenger and the costs of ensuring that safety, necessitate a statute imposing liability without fault. Still, as previously discussed, the legislature must refrain from overregulation to ensure the development of commercial space travel.[258] The approach Pennsylvania courts adopt when imposing strict liability on operators of amusement parks provides that solution.[259] This approach uses the following four-factor test:

> (1) whether the defendant is the only member of the marketing chain available to the injured plaintiff for redress;
> (2) whether the imposition of strict liability would serve as an incentive to safety;
> (3) whether the defendant is in a better position than the consumer to prevent circulation of defective products; and
> (4) whether the defendant can distribute the cost of compensating for injuries resulting from defects by charging for it in the business.[260]

[256] *See id*. at 681 (citing OHIO REV. CODE ANN. § 1327.61(B) (LexisNexis 2006)).

[257] *Id*. at 682.

[258] *See supra* Part II.

[259] *See, e.g*., Rossetti v. Busch Entm't Corp., 87 F. Supp. 2d 415 (E.D. Pa. 2000).

[260] *Id*. at 419 (citing Musser v. Vilsmeier Auction Co., 562 A.2d 279, 282 (Pa. 1989) (citing *Francioni*, 372 A.2d 736)).

[83] The plaintiff bears the burden of establishing the four factors.[261] Congress or the FAA/AST should adopt this standard and explicitly state that it applies not only to sellers of spaceships, but also to buyers that maintain and operate spaceships.[262] Adopting this standard will protect future space tourists and ensure the development of commercial space travel.

A. Whether the Defendant Is the Only Member of the Marketing Chain Available to the Injured Plaintiff for Redress

[84] The Eastern District of Pennsylvania has interpreted the first element to require that the plaintiff show he would likely not recover from the defendant manufacturer before he attempts to recover from another member of the marketing chain.[263] Consequently, the plaintiff must present "any information regarding the identity of parties other than the defendant who might have been involved in the marketing chain."[264] Using Virgin Galactic and The Spaceship Company as an example, a plaintiff will have a difficult time recovering from the companies due to the nature of their corporate relationship.[265] Importantly, this standard will prevent a plaintiff from suing Virgin Galactic and other travel providers as other manufacturers supply them with new spaceships. As a result, the standard keeps regulation during the development of the commercial space

[261] *See id*. at 420 n.3.

[262] Even in this setting, where Pennsylvania common law authorizes the filing of a products liability suit against an amusement park operator, courts remain reluctant to apply the products liability scheme. *Compare* Coppersmith v. Herco Inc., 29 Pa. D. & C.4th 73, 77 (Pa. C.P. 1996) (holding that a broadened meaning of "seller" effectuates the policy behind strict liability), *with Rossetti*, 87 F. Supp. 2d at 419 (quoting Musser v. Vilsmeier Auction Co., 562 A.2d 279, 281 (Pa. 1989)) (declaring limits to strict liability when "the purposes of the policy 'will not be served'").

[263] *See Rossetti,* 87 F. Supp. 2d at 420.

[264] *Coppersmith*, 29 Pa. D. & C.4th at 78.

[265] *See supra* Part V.A (explaining that a plaintiff must pierce the corporate veil in order to combine companies situated similarly to Virgin Galactic and The Spaceship Company to apply a strict liability scheme).

travel business to a minimum, and provides plaintiffs with the opportunity to recover from those responsible for the manufacture of the spaceship.

B. Whether the Imposition of Strict Liability Would Serve as an Incentive to Safety

[85] The Pennsylvania Supreme Court has recognized this standard would be little more than "a futile gesture in promoting the manufacture and distribution of safer products" if the defendant were not "in the business of designing and/or manufacturing any particular product or products."[266] But this flexible standard disappears when unrelated manufacturers begin to make the spaceships used by operators like Virgin Galactic,[267] forcing operators to think twice before pushing a sister company to place an unsafe product on the market solely for the purpose of business development. The standard also incentivizes operators to encourage the private market to manufacture safe spaceships, which will help eliminate strict liability and negligence claims.

C. Whether the Defendant Is in a Better Position than the Consumer to Prevent Circulation of Defective Products

[86] According to Pennsylvania courts, the question of whether the defendant more effectively prevents circulation of defective products "turns on the existence of an ongoing relationship between the defendant and the manufacturer 'from which some financial advantage inures to the benefit of the [manufacturer] and which confers some degree of influence on the [defendant]' in the manufacturing process."[268] Using Virgin Galactic and The Spaceship Company as an example, the relationship

[266] *Musser*, 562 A.2d at 282.

[267] *See* Norris, *supra* note 3 (stating that presently Virgin Galactic receives spaceships exclusively from The Spaceship Company).

[268] *Coppersmith*, 29 Pa. D. & C.4th at 79 (quoting *Musser*, 262 A.2d at 282).

clearly shows The Spaceship Company benefits from Virgin Galactic's success as a space tourism provider.[269]

[87] The second part of this test strengthens the argument that the operator is in a position to prevent circulation of a defective product. Virgin Galactic, by reason of its close connection with The Spaceship Company,[270] has significant influence over The Spaceship Company's manufacturing process. First and foremost, The Spaceship Company has only one client, Virgin Galactic, to which it exclusively provides a product.[271] Secondly, with such a limited number of potential space tourism companies capable of conducting launches in the near future, The Spaceship Company would have difficulty finding another customer.[272] Lastly, the ownership groups of both companies containing at least one mutual member shows the degree of influence Virgin Galactic maintains over the manufacturer of its spaceships.[273]

[88] Importantly, this factor becomes harder for a plaintiff to prove the more advanced and competitive the commercial space market becomes. Thus, as more spaceship providers come onto the scene, the easier it becomes for a plaintiff to bring a claim under traditional strict liability and negligence, and the *Francioni* liability scheme will slowly disappear in favor of more traditional theories of negligence and products liability.

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[269] *See* Norris, *supra* note 3 (describing the exclusive relationship between manufacturer and provider).

[270] *See id*.

[271] *See id*.

[272] *See supra* note 2 (explaining that other business entities are only in the development stages of creating commercial space travel technologies).

[273] *See* Norris, *supra* note 3. Importantly, this factor likely becomes harder for a plaintiff to prove the more advanced and competitive the commercial space market becomes.

D. Whether the Defendant Can Distribute the Cost of Compensating for Injuries Resulting from Defects by Charging for It in the Business

[89] Of the four factors, the defendant's distribution of costs is the easiest for the plaintiff to show. In the same way the Court of Common Pleas found it "reasonable to conclude that the defendant can distribute the cost of compensating for injuries resulting from defective products by charging for it in the price of admission to [an amusement park],"[274] it also seems reasonable to conclude an operator like Virgin Galactic could distribute costs through ticket sales to eager space tourists. Considering passengers will already pay $200,000 to ride in space,[275] an extra few thousand dollars for insurance against a strict liability claim will likely not deter ticket sales, which takes into consideration one of the primary goals seen in modern courts' application of products liability as a cost-shifting platform.[276]

VI. CONCLUSION – *FRANCIONI* MODEL ESSENTIAL TO BLAST-OFF!

[90] The liability scheme derived from *Francioni* provides the FAA/AST answers to questions concerning liability and RLVs while protecting the agency from the dangers of agency capture.[277] The FAA/AST should limit regulation regardless of the addition of humans to RLVs, fostering the long-term innovative development of technologies that make commercial space travel safer. Limits on regulation remain especially important considering the FAA/AST does not yet have a scheme in place to provide this service.[278]

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[274] *Coppersmith*, 29 Pa. D. & C.4th at 79.

[275] *See Booking, supra* note 16.

[276] *Brooks*, 902 P.2d at 60.

[277] *See supra* note 35, for the questions posed by the AST regarding human space flight.

[278] *See* Ryabinkin, *supra* note 38 (explaining that the agency is "developing vehicle and human safety-related guidelines for commercial RLVs.").

[91] But this is not to say that the FAA/AST should disregard the safety of RLV's and their passengers. Congress or the FAA/AST should set a limit on acceptable risk by using the products liability scheme initially used for assessing amusement park liability.[279] Strict liability on operators like Virgin Galactic, provides passengers a cause of action in difficult evidentiary cases, while simultaneously allowing the commercial space travel industry to develop. More importantly, strict liability gives operators and manufacturers, who both likely have a vested interest in the operation taking off, a moment of pause to consider the safety of the lives they carry aboard their newly developed spaceships. Strict liability also prevents the government from placing obstacles like insurance policy requirements and other regulatory impediments on the developing businesses, while at the same time protecting passengers. Just as important, this strict liability scheme will disappear as soon as the need for tighter standards for "sister corporations," protecting operators from liability, fades with more competition. In turn, the competition will lead to innovative developments in the commercial space industry.

[92] A strict liability scheme will ensure the safety of passengers on board commercial space flights. It will also enact a risk-sharing regime not necessarily available through regulations targeting a technology still in development. Thus, to protect passengers, while limiting regulation to encourage the development of the space tourism business, the Pennsylvania model of strict liability should serve as the launching pad for safe commercial space travel to blast off.

[279] *See Rossetti,* 87 F. Supp. 2d at 419.