

# DOLLARS AND SENSE: WHY THE INTERNATIONAL SPACE STATION IS A BETTER INVESTMENT THAN DEEP SPACE EXPLORATION FOR NASA IN A POST-COLUMBIA WORLD

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## I. INTRODUCTION

The International Space Station (“ISS”) is an innovative venture that could not have come to fruition without the collapse of the Cold War. Before that time, the “space race” between the United States and the former Soviet Union beginning in the late 1950s prevented the greatest aerospace scientists in the world from merging minds to create what everyone wanted most—a space station to facilitate prolonged research in antigravity. Now these two superpowers are cooperating with each other and the international community to reach new heights in space research. Outer space is considered the “common heritage of mankind,”<sup>1</sup> much like the Antarctic and the international seabed;<sup>2</sup> therefore the ISS provides a chance for developed, space-faring nations to share resources with developing nations.

However, there is an ongoing debate between developed and developing nations as to the actual meaning of “common heritage” since their respective economic resources are at opposite ends of the spectrum.<sup>3</sup> The Intergovernmental Agreement (“IGA”) that governs the ISS clarified this debate at least as it concerns the intellectual property rights on each space station module.<sup>4</sup> The United States, Russia, and Europe are the dominant forces in space; however, with the National Aeronautics and Space Administration (“NASA”) grounding all U.S.

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1. Lynn M. Fountain, Note, *Creating Momentum in Space: Ending the Paralysis Produced by the “Common Heritage of Mankind” Doctrine*, 35 CONN. L. REV. 1753, 1753 (2003).

2. Leo B. Malagar & Marlo Apalisok Magdoza-Malagar, *International Law of Outer Space and the Protection of Intellectual Property Rights*, 17 B.U. INT’L L.J. 311, 342 (1999); Lawrence L. Risley, *An Examination of the Need to Amend Space Law to Protect the Private Explorer in Outer Space*, 26 W. ST. U. L. REV. 47, 57 (1998–1999).

3. See Malagar & Magdoza-Malagar, *supra* note 2, at 342–43; Kevin V. Cook, Note, *The Discovery of Lunar Water: An Opportunity to Develop a Workable Moon Treaty*, 11 GEO. INT’L ENVTL. L. REV. 647, 648 (1999).

4. See *infra* note 50.

shuttle flights since the *Columbia* tragedy in February 2003, there is much concern about further construction and scientific research on the ISS. The future of the ISS depends upon U.S. resources and participation because the other partners are not equipped to carry the burden alone.

The ISS is essentially a laboratory in Earth's lower orbit which allows scientists to perform research in microgravity that cannot be done as well, if at all, on the Earth's surface.<sup>5</sup> It consists of a series of interlocking modules, which contain living quarters for the astronauts in addition to the labs.<sup>6</sup> The ISS currently suffers from degraded environmental systems and exercise equipment vital to the astronauts, and there are concerns about safely transporting astronauts and payload to the ISS.<sup>7</sup> Only a handful of astronauts can live there at one time, so they can only conduct a limited number of scientific experiments.<sup>8</sup> Fewer experiments mean fewer patents. This is discouraging because patents validate the expense of the ISS as evidence of true scientific progress. NASA has an obligation to work with its international partners to remedy the ailing ISS and send consecutive crews so that research can continue. But, NASA cannot fulfill those obligations until it remedies its internal issues regarding employee morale and mission safety. The investigation into the *Columbia* incident revealed deep-seated problems at NASA, yet President George W. Bush directed the agency to set aside its internal problems and international commitments in order to fulfill his own unjustified goals of traveling to the moon and Mars.<sup>9</sup> NASA must fight to set its own priorities before the government forces it to make hasty decisions that jeopardize the safety of its astronauts and the reputation of its engineers.

This Note begins with a look at the current international laws governing outer space and the ISS in Section II, including how the IGA solves the issue of whose intellectual property regime will govern technological breakthroughs that occur on the ISS. Section III focuses on specific issues in the United States: domestic legislation concerning inventions and patent rights in outer space; NASA's guidelines and bilateral agreements with ISS partners on patent ownership; and the commercial objectives of NASA in relation to the ISS. The analysis in Section IV explores domestic and international reactions to the *Columbia* tragedy, how NASA plans to implement recommendations by

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5. Rochus Moenter, *The International Space Station: Legal Framework and Current Status*, 64 J. AIR L. & COM. 1033, 1035-36 (1999).

6. *See id.*

7. Sean O'Keefe, *Columbia's Legacy in Action*, WASH. POST, Oct. 24, 2003, at A25 [hereinafter O'Keefe, *Columbia's Legacy in Action*]; *see also NASA's Hushed Debate*, WASH. POST, Oct. 28, 2003, at A22.

8. Bruce Moomaw, *The Science of Spending Billions*, SPACE DAILY.COM, at <http://www.spacedaily.com/news/iss-02h1.html> (Sept. 21, 2002).

9. *See generally* Brian Deagon, *Bush Maps Next Leaps for Mankind in Space: Moon Base, Then Mars*, INVESTOR'S BUS. DAILY, Jan. 15, 2004, at A01.

the accident investigation board, and the importance of continued U.S. participation in the ISS. Section V provides an overview of recent space exploration events, including the twin Mars rovers and the Bush administration's surprising new goals for NASA. Section VI recommends temporarily setting aside endeavors to explore the solar system and instead focusing precious resources on repairing NASA's internal problems and developing patentable technologies that can improve life on Earth. The ISS is the key to major technological and medical breakthroughs, the effects of which could drastically improve human life and postpone the need to search for alternative habitats in outer space. NASA can bolster its financial and intellectual resources by enlisting additional help from private corporations, providing them with the incentive of more flexible patent rights.

## II. INTERNATIONAL LAWS GOVERNING OUTER SPACE AND THE ISS

### A. *Outer Space: Exploration, Appropriation, and the United Nations*

#### 1. *The Outer Space Treaty of 1967 and the Common Heritage Doctrine*

Outer space was characterized in the early 1950s as a legal entity that should be governed by international law through the United Nations ("UN"), but space exploration was thought to be far in the future and, thus, there was no urgency to solidify the law.<sup>10</sup> Then the launchings of *Sputnik* in the former Soviet Union and *Explorer I* in the United States occurred consecutively in 1957, and UN members suddenly realized that they could delay no longer.<sup>11</sup> The Outer Space Treaty<sup>12</sup> was adopted in 1967 after ten years of policy debates and negotiations.<sup>13</sup> It has been dubbed the "Magna Carta of Space" due to its role as the first international treaty on space law.<sup>14</sup>

During this first space lawmaking process, the UN was reacting to the Cold War and an arms race between the United States and the Soviet Union which extended to outer space.<sup>15</sup> It created the Committee on the Peaceful Uses of Outer Space ("COPUOS") in 1959<sup>16</sup> to study peaceful

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10. Malagar & Magdoza-Malagar, *supra* note 2, at 320.

11. *Id.*

12. 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, 610 U.N.T.S. 205 [hereinafter Outer Space Treaty] (adopted by the UN General Assembly in its resolution 2222 (XXI)).

13. Malagar & Magdoza-Malagar, *supra* note 2, at 320.

14. *Id.* at 320–21.

15. *Id.* at 328.

16. COPUOS was accorded duties and an infrastructure by the UN: The Committee on the Peaceful Uses of Outer Space was set up by the General Assembly in 1959 (resolution 1472 (XIV)) to review the scope of international cooperation in peaceful uses of outer

uses of outer space that the UN could legally regulate.<sup>17</sup> The Cold War divided the then twenty-four member states into two factions—the Western Bloc and the Soviet Bloc, with five remaining unaligned—but they still managed to reach a number of decisions through adherence to a rule of consensus.<sup>18</sup> Today, free of the former political barriers, COPUOS has sixty-seven member states that meet annually to share information and discuss legal problems arising from space exploration.<sup>19</sup>

One concept that is a subject of modern controversy is the “common heritage of mankind” doctrine (“common heritage doctrine”)<sup>20</sup> inherent in the foundational space laws. Appearing in both the Outer Space Treaty and the Moon Treaty,<sup>21</sup> the common heritage doctrine decrees that the exploration and use of outer space and its celestial bodies “shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development, and shall be the province of all mankind.”<sup>22</sup> There is an enduring struggle between developing and developed countries over what this language actually means due to their inequalities of technology and capital.<sup>23</sup> Developing countries take the doctrine at face value, claiming that they have the greatest need for shared resources and should maintain some control over international exploration to prepare for the day when they can actively participate.<sup>24</sup> Developed countries see a loophole in the language and adopt the interpretation that states can exploit space resources for their own benefit, as long as they do not appropriate or

space, to devise programmes in this field to be undertaken under United Nations auspices, to encourage continued research and the dissemination of information on outer space matters, and to study legal problems arising from the exploration of outer space.

Number of Member States in the Committee: 67.

The Committee has two standing Subcommittees of the whole: the Scientific and Technical Subcommittee; and the Legal Subcommittee.

United Nations Office for Outer Space Affairs, United Nations Committee on the Peaceful Uses of Outer Space, at <http://www.oosa.unvienna.org/COPUOS/copuos.html> (last updated Jan. 26, 2005) (describing COPUOS).

17. Malagar & Magdoza-Malagar, *supra* note 2, at 328.

18. *Id.* at 329.

19. The sixty-seven member states of COPUOS, per GA Resolution 59/116, are: Albania, Algeria, Argentina, Australia, Austria, Belgium, Benin, Brazil, Bulgaria, Burkina Faso, Cameroon, Canada, Chad, Chile, China, Colombia, Cuba, Czech Republic, Ecuador, Egypt, France, Hungary, Germany, Greece, India, Indonesia, Iran, Iraq, Italy, Japan, Kazakhstan, Kenya, Lebanon, Libyan Arab Jamahiriya, Malaysia, Mexico, Mongolia, Morocco, the Netherlands, Nicaragua, Niger, Nigeria, Pakistan, Peru, Philippines, Poland, Portugal, Republic of Korea, Romania, the Russian Federation, Saudi Arabia, Senegal, Sierra Leone, Slovakia, South Africa, Spain, Sudan, Sweden, Syrian Arab Republic, Thailand, Turkey, the United Kingdom of Great Britain and Northern Ireland, the United States of America, Ukraine, Uruguay, Venezuela, and Viet Nam. See United Nations Office for Outer Space Affairs, United Nations Committee on the Peaceful Uses of Outer Space: Members, *available at* <http://www.oosa.unvienna.org/COPUOS/members.html> (last updated Jan. 26, 2005).

20. Fountain, *supra* note 1, at 1753.

21. Agreement Governing the Activities of States on the Moon and Other Celestial Bodies, *opened for signature* Dec. 18, 1979, 1363 U.N.T.S. 22 [hereinafter Moon Treaty].

22. Outer Space Treaty, *supra* note 12, art. I, 18 U.S.T. at 2412, 610 U.N.T.S. at 207; *see also* Moon Treaty, *supra* note 21, art. 4, 1363 U.N.T.S. at 23.

23. Malagar & Magdoza-Malagar, *supra* note 2, at 343; Cook, *supra* note 3, at 648.

24. See Malagar & Magdoza-Malagar, *supra* note 2, at 343.

claim jurisdiction over them.<sup>25</sup> Their stance is that they worked hard to develop the technology and should not have to share the benefits when the developing countries have contributed little or nothing to the efforts.<sup>26</sup> Though the latter view seems justified because of the immense capital necessary for space exploration, it appears greedy in this setting of harmonious international policy that took so many years to develop in the face of obstacles such as the Cold War.

Developed countries are embracing another controversial idea in the treaties that actually caused most of these countries, including the United States, to refuse to sign the Moon Treaty. Both the Outer Space Treaty and Moon Treaty prohibit national appropriation of celestial bodies or resources,<sup>27</sup> effectively taking them out of the space real estate market. While this prohibition is in accord with the common heritage doctrine, developed countries see it as restrictive of the future growth of space exploration and exploitation and consider it obsolete.<sup>28</sup> There is also a debate over the interpretation of language in the Outer Space Treaty concerning whether private companies are incorporated in the non-appropriation clause. Articles VI and VII of the Outer Space Treaty note that it is supposed to govern all activities of both governmental and nongovernmental entities,<sup>29</sup> but some states argue that the absence of the term “private companies” implies that only national entities are restricted.<sup>30</sup>

It is fair to assume that the UN and treaty signatories would react angrily should any private company actually try to appropriate a celestial body. In 2001, one company in California, Space Development Corporation (“SpaceDev”), boasted about testing UN policy, but did not actually achieve appropriation.<sup>31</sup> SpaceDev’s chairman and chief executive officer, Jim Benson, planned to declare ownership of an asteroid regardless of UN approval, stating: “There’s really no entity to which such a claim of ownership can be made. Therefore I believe it just needs to be made to the public in general.”<sup>32</sup> A Nevada man founded a space real estate company based upon the arguable loophole in the

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25. *Id.*

26. *Id.*

27. See Fountain, *supra* note 1, at 1763–64.

28. *Id.* at 1764.

29. See Outer Space Treaty, *supra* note 12, arts. VI–VII, 18 U.S.T. at 2415, 610 U.N.T.S. at 209; Malagar & Magdoza-Malagar, *supra* note 2, at 345.

30. Risley, *supra* note 2, at 49; Fountain, *supra* note 1, at 1763.

31. See Risley, *supra* note 2, at 62. Founded in 1997, SpaceDev is the world’s first publicly traded commercial space exploration and development company. See SpaceDev, Inc., Company, at <http://www.spacedev.com/newsite/templates/subpage3.php?pid=338&subNav=11&subSel=1> (last visited Mar. 16, 2005). SpaceDev designs, assembles, tests, and markets affordable micro space systems including sophisticated micro-satellites, low-power high performance flight computers, miniature S-Band transponders, hybrid rocket-based orbital maneuvering and orbital transfer vehicles (“MTVs”), and safe hybrid rocket motors for sub-orbital space tourism applications. *Id.*

32. Kenneth Silber, *A Little Bit of Heaven*, REASON, Nov. 1998, at 48.

Outer Space Treaty.<sup>33</sup> Dennis Hope and his Lunar Embassy sell private property on the moon, Mars, Venus, and Mercury via the Internet, but the UN has apparently decided to ignore them for now.<sup>34</sup>

## 2. *Treaties as Law*

Treaties are sometimes questioned as sources of binding law and viewed more as contracts that create rights and obligations.<sup>35</sup> These formal agreements are very powerful considering the time and effort put forth into negotiations between countries around the world. They exist as international customs or uses, but can lead to actual law if signatories codify them within their domestic bodies of law.<sup>36</sup>

Treaties are the most appropriate way to control environments categorized as *res communis*, meaning the territory of no nation, but open to the entire international community.<sup>37</sup> The space treaties borrowed the common heritage doctrine from treaties covering the Antarctic, the high seas, and the international seabed. The Antarctic Treaty<sup>38</sup> encourages cooperative and peaceful scientific research in the Antarctic and minimization of environmental impacts, although countries have been claiming territory in the frozen desert since 1908.<sup>39</sup> The Convention on the High Seas<sup>40</sup> and the UN Convention on the Law of the Sea (“UNCLOS”)<sup>41</sup> control international activity involving international waters and deep seabed minerals, respectively. States are not allowed to establish control over international waters or interrupt trade,<sup>42</sup> and UNCLOS created entities to facilitate orderly exploration of deep seabed resources and to minimize both disruption of the ocean floor and sediment discharge from mining ships.<sup>43</sup>

The three frontiers—space, sea, and seabed—are similar in that they each generate great environmental concern, as well as debates between developed and developing countries over how to control exploration and

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33. See generally The Lunar Embassy, World Headquarters, at <http://www.lunarembassy.com/lunar/index2.lasso> (last updated Mar. 11, 2005).

34. *Id.* Hope says he has claimed the celestial property much as pioneers claimed the Wild West, *id.*, but any first-year law student can attest that he only has constructive possession at best—title cannot be tested until man has the capability to travel freely in space. For now, buyers only have a piece of paper and a good party story.

35. Malagar & Magdoza-Malagar, *supra* note 2, at 332.

36. *Id.* at 332–33.

37. *Id.* at 342; Barbara Ellen Heim, Note, *Exploring the Last Frontiers for Mineral Resources: A Comparison of International Law Regarding the Deep Seabed, Outer Space, and Antarctica*, 23 VAND. J. TRANSNAT'L L. 819, 820 (1990).

38. Antarctic Treaty, Dec. 1, 1959, 12 U.S.T. 794, 402 U.N.T.S. 71.

39. See Risley, *supra* note 2, at 54; Heim, *supra* note 37, at 839.

40. Convention on the High Seas, *opened for signature* Apr. 29, 1958, 13 U.S.T. 2312, 450 U.N.T.S. 11, 82.

41. United Nations Convention on the Law of the Sea, *opened for signature* Dec. 10, 1982, art. 136, 1833 U.N.T.S. 397, 446 (concerning mining in the deep seabed).

42. Risley, *supra* note 2, at 53.

43. Heim, *supra* note 37, at 824–25.

distribution of benefits. COPUOS decided in 1961 to adhere to the rule of consensus, thus space law is made by unanimous agreements on compromises.<sup>44</sup> Comparatively, UNCLOS allows a one-party-one-vote rule, which gives control of international seabed activities to developing countries since they outnumber developed countries in the UN.<sup>45</sup> The quandary with space is that technology changes so rapidly that the law can barely keep up. Space law and policy are often intertwined because many decisions on the law are influenced by international politics during development.<sup>46</sup> The body of space law is apt to continually evolve and invoke debate.

### *B. The IGA: Structure of the ISS and Patent Rights*

#### *1. Development of the IGA and Structure of the ISS*

The concept of a space station was proposed by the United States in 1984.<sup>47</sup> Other states were later invited to participate in this space station to facilitate scientific research in the microgravity of Earth's lower orbit.<sup>48</sup> The IGA was signed in 1988 by NASA, the European Space Agency ("ESA"), and the Canadian Space Agency ("CSA"), followed by the Japanese government in 1989.<sup>49</sup> When Russia joined the project in 1993, the IGA was renegotiated and a new version was ratified in 1998.<sup>50</sup> The IGA gives the ISS a "hub and spoke" structure, in which NASA acts as the hub over the spokes of partner states.<sup>51</sup> As project manager, NASA coordinates all of the programs, management, system engineering, safety, and integrated operations of the station.<sup>52</sup>

#### *2. Patent Rights on Inventions Created on the ISS*

Each partner state has a module on the ISS that is governed by its own laws, including intellectual property laws, like a mini-territory.<sup>53</sup> To

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44. Malagar & Magdoza-Malagar, *supra* note 2, at 329–30.

45. Heim, *supra* note 37, at 825–26.

46. Malagar & Magdoza-Malagar, *supra* note 2, at 332.

47. Fountain, *supra* note 1, at 1768.

48. *Id.*

49. *Id.*; see also Agreement Among the United States of America, Governments of Member States of the European Space Agency, the Government of Japan, and the Government of Canada on Cooperation in the Detailed Design, Development, Operation, and Utilization of the Permanently Manned Civil Space Station, Sept. 29, 1988, Temp. State Dep't No. 92-65, CTIA No. 6781.000. This Agreement has been recalled following a renegotiated Agreement ratified in 1998. See *infra* note 50.

50. Agreement Among the Government of Canada, Governments of the Member States of the European Space Agency, the Government of Japan, the Government of the Russian Federation, and the Government of the United States of America Concerning Cooperation on the Civil International Space Station, Jan. 29, 1998, Temp. State Dep't No. 01-52, CTIA No. 10073.000 [hereinafter IGA].

51. Fountain, *supra* note 1, at 1769.

52. *Id.*

53. *Id.* at 1768–69.

simplify patent issues, whichever country owns the module where an invention is created can thereby assert its patent laws over the invention, regardless of the nationality of the inventor or the sponsoring entity.<sup>54</sup> Article 21, paragraph 2 of the IGA specifically states: “[F]or purposes of intellectual property law, an activity occurring in or on a Space Station flight element shall be deemed to have occurred only in the territory of the Partner State of that element’s registry.”<sup>55</sup> Paragraph 2 goes on to prohibit states from contracting away their territorial jurisdiction.<sup>56</sup> However, the inventor’s country is entitled to patent rights if the subject matter is classified or is an issue of national security.<sup>57</sup>

### III. U.S. LAW AND NASA GUIDELINES ON GOVERNMENTAL AND NON-GOVERNMENTAL PATENT RIGHTS IN OUTER SPACE

#### A. U.S. Statutes Governing Patent Rights in Outer Space

While the IGA was drafted to pull together the differing laws of all the ISS partners and establish a long-term international cooperative framework, existing U.S. laws from the 1950s to the present are still important to the domestic interest.<sup>58</sup> The United States passed most of its existing outer space patent legislation—including the NASA Act of 1958, Titles 15 and 35 of the United States Code (“U.S. Code”), and the Freedom of Information Act—long before the ISS was a gleam in NASA’s eye.<sup>59</sup>

The NASA Act of 1958 sets forth property rights in inventions that are contractually related to NASA.<sup>60</sup> Any patent resulting from a joint venture between NASA and a private entity will automatically be issued to the federal government.<sup>61</sup> However, NASA has begun to waive this right in order to encourage private investment in space activities.<sup>62</sup> NASA may take a license on the invention and allow the private company to hold the patent; however, NASA will assume control of

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54. *See id.*

55. IGA, *supra* note 50, at art. 21, ¶ 2; *see* Office of the General Counsel, NASA, Intellectual Property and the International Space Station: Creation, Use, Transfer, Ownership and Protection, at Part I.A.9 (1999) [hereinafter OGC Guide], available at <http://www.hq.nasa.gov/ogc/iss/main.html> (last visited Mar. 16, 2005); *see also* Office of the General Counsel, NASA, Intellectual Property and the International Space Station: Creation, Use, Transfer, Ownership and Protection—Executive Summary (Sept. 1999) [hereinafter OGC Guide Executive Summary], available at [http://www.hq.nasa.gov/ogc/iss/exec\\_summary.html](http://www.hq.nasa.gov/ogc/iss/exec_summary.html) (last visited Mar. 16, 2005).

56. *See* OGC Guide, *supra* note 55, at Part I.A.9 (commentary).

57. *See* IGA, *supra* note 50, at art. 21, ¶ 3.

58. *See* OGC Guide Executive Summary, *supra* note 55.

59. *Id.*

60. *See* National Aeronautics and Space Act of 1958, 42 U.S.C. § 2457 (2000). The entire NASA Act is set forth in 42 U.S.C. § 2451 *et seq.*

61. *Id.*

62. Jocelyn H. Shoemaker, Note, *The Patents in Space Act: Jedi Mind Trick or Real Protection for American Inventors on the International Space Station?*, 6 J. INTELL. PROP. L. 395, 397 (1999).

patents when the private inventors do not assert their patent rights.<sup>63</sup> Either way, both parties must agree to keep any sensitive information private in the interest of national security, private records, or prior art.<sup>64</sup> Title 15 of the U.S. Code relates to cooperative research and development agreements, and Title 35 governs royalties paid to NASA on government patents.<sup>65</sup>

The 1990 Patents in Space Act was another measure taken by the government to encourage private investment, and it is codified in Title 35 of the U.S. Code as part of the body of rules on patentable inventions.<sup>66</sup> It extends federal jurisdiction to U.S. space objects and any activities carried out on them to ensure that all private or governmental investments are protected by U.S. law.<sup>67</sup> Exceptions are made for any international activities—whether they are performed on another country’s space object or in conjunction with an international partner—which are governed by treaties to which the United States is a signatory.<sup>68</sup> Title 35 also holds exceptions to the federal Freedom of Information Act when information regarding patents is an issue of national security or otherwise sensitive, or the dissemination of which would preclude a party from obtaining a rightful patent.<sup>69</sup>

NASA made bilateral agreements called Memoranda of Understanding (“MOUs”) with each of its four ISS partners in January 1998 to buttress the IGA and to help establish property rights and responsibilities of each partner in the ISS components, as well as in proprietary data and goods.<sup>70</sup> The MOUs defer to the IGA regarding intellectual property rights,<sup>71</sup> mainly because of the differing international patent regimes—the United States has a “first to invent” system, while most other countries have a “first to file” system.<sup>72</sup> Perhaps the only problem with the IGA is that it frustrates some of the United States’ goals regarding commercial investment in space activities. While the Patents in Space Act is basically a self-serving law to guarantee protection of U.S. inventions in space, the IGA protects harmonious, multinational interests.<sup>73</sup> This incompatibility renders the Patents in

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63. See OGC Guide Executive Summary, *supra* note 55.

64. See *id.*

65. *Id.*; 35 U.S.C. § 207 (2000).

66. 35 U.S.C. § 105.

67. Shoemaker, *supra* note 62, at 398.

68. See 35 U.S.C. § 105.

69. OGC Guide Executive Summary, *supra* note 55. The Freedom of Information Act is codified in 5 U.S.C. § 552. Examples of Freedom of Information Act exceptions can be found at 35 U.S.C. §§ 205, 209.

70. Shoemaker, *supra* note 62, at 416; OGC Guide Executive Summary, *supra* note 55.

71. Shoemaker, *supra* note 62, at 417–18.

72. *Id.* at 406. In “first to file” countries, there is a race to the patent office; that is, the first inventor to file a patent application trumps those who may have actually invented the technology first. See MARTIN J. ADELMAN ET AL., CASES AND MATERIALS ON PATENT LAW 179 (2d ed. 2003). The exclusive “first to invent” system in the United States allows the first true inventor to obtain a patent based upon sufficient proof, even if he was not the first to file. *Id.*

73. Shoemaker, *supra* note 62, at 420.

Space Act powerless to protect the patent rights of private U.S. inventors on the ISS; therefore, investors will be hesitant to get involved in what NASA had hoped would be an attractive venue for commercial outer space research.<sup>74</sup>

### B. NASA's Commercial Development Plan for the ISS

“It was a thunderingly beautiful experience—voluptuous, sexual, dangerous, and expensive as hell.”<sup>75</sup> While this description of the *Apollo* space launches in 1973 from author Kurt Vonnegut, Jr., aptly captured the excitement surrounding space exploration at the time, people now regard shuttle launches as mundane or reserved for science aficionados. Interest is only aroused when disaster strikes or price tags are revealed. The controversies surrounding \$20 million round-trip tickets on the Russian *Soyuz* bought by billionaires Dennis Tito in 2001 and Mark Shuttleworth in 2002, as well as entertainer Lance Bass's failed and ridiculed attempt shortly thereafter,<sup>76</sup> are proof that most citizens are not yet ready to embrace space as a feasible travel destination or marketplace. As such, many people may be surprised to learn that NASA's long-term objective with the ISS is to turn it into a commercial marketplace where supply and demand are dominated by the private sector.<sup>77</sup> For space products and services to become a factor in the national economy, it is clear that private companies must make them attractive, useful, and affordable to the public.

As discussed earlier, NASA often waives its patent rights under the NASA Act to encourage private investment.<sup>78</sup> It subverts the automatic grant of patent rights to the federal government by entering into Space Act Agreements with private entities, which are not “contracts” subject to the NASA Act.<sup>79</sup> The Space Act Agreements are instead considered “other transactions” as authorized by Section 203(c)(5) of the NASA Act, which confers a different allocation of intellectual property rights so long as the party is not doing work specifically for NASA.<sup>80</sup> The following factors determine the nature of the conferred intellectual

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74. *Id.* at 419.

75. R. Thomas Rankin, Note, *Space Tourism: Fanny Packs, Ugly T-Shirts, and the Law in Outer Space*, 36 SUFFOLK U. L. REV. 695, 695 (2003) (quoting Kurt Vonnegut, Jr., from a 1973 *Playboy* interview, excerpted in Vonnegut's book *Wampeters, Foma & Granfalloon* (Delacorte Press 1974)).

76. Richard Stenger, *Soyuz Reserved for Private Trip to Space Station*, CNN.COM, at <http://www.cnn.com/2003/TECH/space/06/18/soyuz.tourists/index.html> (June 18, 2003).

77. OGC Guide Executive Summary, *supra* note 55.

78. *See supra* note 61 and accompanying text.

79. OGC Guide, *supra* note 55, at Part II.A.4.

80. *Id.* Specifically, the Space Act authorizes NASA

to enter into and perform such contracts, leases, cooperative agreements, or *other transactions* as may be necessary in the conduct of its work and on such terms as it may deem appropriate, with any agency or instrumentality of the United States, or with any State, Territory, or possession, or with any political subdivision thereof, or with any person, firm, association, corporation, or educational institution.

42 U.S.C. § 2473(c)(5) (2000) (emphasis added).

property rights:

(1) the identity of the other party to the agreement; (2) the purpose of the agreement; (3) whether the agreement is reimbursable or nonreimbursable; (4) whether NASA's responsibilities involve inventive or creative activities, or only provide use of facilities, or involve exchanges of information; (5) whether there is adequate coverage of royalty sharing opportunities for NASA employee inventors; and (6) the avoidance of inappropriate technology transfer in agreements with foreign entities.<sup>81</sup>

NASA can confer its allocation of utilization rights on the ISS to users of its choice, according to Article 9, paragraph 3 of the IGA.<sup>82</sup> It has three mechanisms with which it can confer these rights: Space Act Agreements, Cooperative Research and Development Agreements ("CRADAs"), and Chiles Act Cooperative Agreements.<sup>83</sup> Space Act Agreements were discussed in detail above, but for comparison purposes it should be noted that any NASA constituent can be a party, and there are no limitations on the purposes of the Agreements so long as they are within the bounds of NASA's mission.<sup>84</sup> The CRADAs are less flexible and are infrequently used by NASA because the governmental party must be a research laboratory, and the purpose of the agreement must stipulate a very specific area of research.<sup>85</sup> When a party wants to transfer something of value to carry out a public purpose that requires a substantial amount of NASA's help, the agreement falls under the Chiles Act, which governs cooperative agreements as legal instruments between the U.S. government and other parties.<sup>86</sup> NASA cannot use a Chiles Act Cooperative Agreement for its own specific missions; it must be used for public purposes within missions.<sup>87</sup>

#### IV. THE CONTINUING EFFECTS OF THE *COLUMBIA* TRAGEDY ON NASA, FOREIGN SPACE AGENCIES, AND THE ISS

##### A. *The Space Shuttle Columbia Disaster*

*It's kind of with mixed emotions that we get ready to come home. But we have enough fond memories to last us a lifetime.*  
—Columbia space shuttle astronaut Michael Anderson, in a communication with NASA's Mission Control late Friday afternoon, January 31, 2003, the day before the explosion.<sup>88</sup>

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81. OGC Guide, *supra* note 55, at Part II.A.4.

82. See IGA, *supra* note 50, at art. 9, ¶ 3.

83. OGC Guide, *supra* note 55, at Part II.

84. OGC Guide Executive Summary, *supra* note 55.

85. *Id.*

86. 31 U.S.C. § 6305 (2000).

87. OGC Guide, *supra* note 55, at Part II.C; see also 42 U.S.C. § 2473(c)(5) (2000).

88. Richard Roeper, *Lack of Attention Just Sign of Troubled Times*, CHI. SUN-TIMES, Feb. 3,

On the morning of February 1, 2003, the space shuttle *Columbia* exploded roughly forty miles above northeastern Texas,<sup>89</sup> leaving a 700-mile debris trail over three states.<sup>90</sup> Texas residents were confused as they awoke to thunderous noises, a rapidly moving fireball, and huge condensation trails in the sky.<sup>91</sup> All seven astronauts of the diverse crew—five men and two women, including an African American, an Indian, and an Israeli—were killed, causing a tragedy reminiscent of the *Challenger* disaster in January 1986.<sup>92</sup> In a world still reeling from 9/11 and heading into another conflict with Iraq, the first thought on the public's mind was that the shuttle had fallen victim to a terrorist attack.<sup>93</sup> That theory was quickly disproved, as NASA uncovered problems with the shuttle's structure. The independent Columbia Accident Investigation Board ("CAIB") was formed within two hours of Mission Control's loss of signal from the shuttle, per procedures established by NASA following the *Challenger* accident.<sup>94</sup>

The CAIB released Volume I of its Report in August 2003 after seven months of thorough investigation into both the particular physical cause of *Columbia*'s fate and the general safety practices at NASA. The physical cause was a piece of insulating foam that separated from the external fuel tank shortly after liftoff, damaging the left wing.<sup>95</sup> The damage did not affect *Columbia*'s mission in space, but increasing aerodynamic forces during re-entry were too much for the weakened wing to handle, causing the orbiter to completely disintegrate.<sup>96</sup> The CAIB determined that widespread organizational problems at NASA, rooted in its history and culture, also contributed greatly to this accident and the vulnerability of the entire space shuttle program.<sup>97</sup> Known safety issues such as foam defects were often ineffectively communicated or ignored.<sup>98</sup>

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2003, at 11.

89. MARCIA S. SMITH, CONG. RES. SERV., NASA'S SPACE SHUTTLE *COLUMBIA*: QUICK FACTS AND ISSUES FOR CONGRESS, at [http://usinfo.state.gov/usa/infousa/tech/space/crs\\_columbia.pdf](http://usinfo.state.gov/usa/infousa/tech/space/crs_columbia.pdf) (last updated Apr. 17, 2003).

90. James Millbank, *700 Miles of Debris*, THE NEWS OF THE WORLD, Feb. 2, 2003, available at LEXIS, News Library, The News of the World File.

91. See *id.*

92. See 1 COLUMBIA ACCIDENT INVESTIGATION BD., REPORT 29, 99 (Aug. 2003) [hereinafter CAIB REPORT], available at <http://www.caib.us/news/report/volume1/default.html>. The CAIB released Volumes II–VI of its report in October 2003, available at <http://www.caib.us/news/report/default.html>. The additional volumes are actually appendices to Volume I containing investigation records, conclusions, and proposed, but unadopted, recommendations.

93. Roeper, *supra* note 88.

94. CAIB REPORT, *supra* note 92, at 6.

95. *Id.* at 9.

96. *Id.*

97. See *id.* The CAIB report identified historical organizational problems such as compromises with the government, resource constraints, fluctuating priorities, and schedule pressures. *Id.* Cultural practices that proved detrimental to safety include reliance on past success instead of continued testing; organizational barriers that prevent communication of safety issues and stifle professional differences of opinion; and a lack of integrated management across program elements. *Id.*

98. See *id.*

One editorial made an inflammatory comparison about the composition of the CAIB compared with that of the *Challenger* investigatory board. After the *Challenger* explosion in 1986, President Ronald Reagan appointed a thirteen-member board headed by former Secretary of State William P. Rogers and consisting primarily of astronauts, scientists, and pilots.<sup>99</sup> The Rogers Commission, as it came to be known, pinpointed *Challenger*'s faulty O-rings and the breakdown of NASA management in a quick four months.<sup>100</sup> By contrast, the CAIB consists of mostly high-ranking military officials appointed by then NASA head Sean O'Keefe.<sup>101</sup> The editorial suggests that the CAIB may not be as objective because it is not intellectually diverse and was compiled by the very people being investigated.<sup>102</sup> But that author penned his criticism a mere two days after the *Columbia* disaster. The CAIB wrote a poignant explanation of why its investigation took almost twice as long as that of its predecessor:

The crew members lost that morning were explorers in the finest tradition, and since then, everyone associated with the Board has felt that we were laboring in their legacy. Ours, too, was a journey of discovery: We sought to discover the conditions that produced this tragic outcome and to share those lessons in such a way that this nation's space program will emerge stronger and more sure-footed. If those lessons are truly learned, then *Columbia*'s crew will have made an indelible contribution to the endeavor each one valued so greatly.<sup>103</sup>

The Rogers Commission did identify certain managerial problems at NASA, but they were mostly surface problems that had a direct connection to the *Challenger* failure.<sup>104</sup> As the CAIB recognized, complex systems tend to fail in complex ways.<sup>105</sup> The deep-seated problems only compounded over time until they violently erupted in the *Columbia* tragedy. Space travel is inherently risky, but by being proactive in investigating potential safety issues, some of that risk can be eliminated. The CAIB clearly did not want another shuttle crew to be sacrificed before NASA was held accountable for its degrading work culture.

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99. *Ingredients of an Inquiry*, ST. LOUIS POST-DISPATCH, Feb. 3, 2003, at B6.

100. *Id.*

101. *Id.* Actually, the thirteen-member CAIB consists of five high-ranking military officials, four college professors (including former astronaut Sally Ride), three government agency officials, and one corporate executive. See CAIB REPORT, *supra* note 92, at 7. By simply looking at their titles, these Board members bring forth a wealth of knowledge about aerospace activities and proper safety practices.

102. See *Ingredients of an Inquiry*, *supra* note 99.

103. CAIB REPORT, *supra* note 92, at 6.

104. See *id.* at 100.

105. *Id.*

*B. NASA's Post-Columbia Actions to Renovate the Space Program*

NASA diligently responded to the CAIB's call by grounding the shuttle fleet until the CAIB Report recommendations could be implemented.<sup>106</sup> It initiated the Return to Flight Task Group ("Task Group") in July 2003 to assess the CAIB Report and its own plans to return safely to space.<sup>107</sup> The external Task Group consists of twenty-seven independent members and one nonvoting *ex officio* NASA member, and it is co-chaired by two veteran astronauts, Lieutenant General Thomas Stafford and Richard O. Covey.<sup>108</sup> Per its charter, the Task Group will meet as often as necessary and continually report to NASA for two years unless terminated or renewed.<sup>109</sup> NASA now publishes a living document referred to as the "Return to Flight Implementation Plan," which is periodically revised as the agency's long-term plans change in response to the CAIB Report and President Bush's new exploration plan.<sup>110</sup> There is a separate document reporting continuous improvement actions for the ISS as these two plans are implemented.<sup>111</sup>

To help gather and assess data on the work culture and climate issues, NASA hired Behavioral Science Technology ("BST"), a California company that specializes in behavior-based performance improvement.<sup>112</sup> BST found that, while there were many positive aspects to NASA's culture ("deeply imbedded values and beliefs of an organization") and climate ("prevailing influences on a particular area of function at a particular time"), several improvements were needed to fully reflect the agency's espoused core values: safety, people, excellence, and integrity.<sup>113</sup> For instance, NASA employees work extremely well together at the peer level (e.g., engineer-to-engineer or manager-to-manager) and have a strong commitment to their technical work; yet they show no strong commitment to the agency because they feel a lack of respect and appreciation by upper management.<sup>114</sup> Of greatest

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106. O'Keefe, *Columbia's Legacy in Action*, *supra* note 7.

107. SEAN O'KEEFE, RETURN TO FLIGHT TASK GROUP CHARTER 1 (July 18, 2003) [hereinafter O'KEEFE, TASK GROUP CHARTER], available at <http://www.returntoflight.org/assets/pdf/charter.pdf>.

108. See Return to Flight Task Group, Members, at <http://www.returntoflight.org/members/default.asp> (last visited Mar. 16, 2005) (listing Task Group members and providing links to their profiles).

109. O'KEEFE, TASK GROUP CHARTER, *supra* note 107, at 2-3.

110. See NASA, 1 NASA'S IMPLEMENTATION PLAN FOR SPACE SHUTTLE RETURN TO FLIGHT AND BEYOND, available at [http://www.nasa.gov/pdf/64186main\\_RTF\\_rev2-2\\_full.pdf](http://www.nasa.gov/pdf/64186main_RTF_rev2-2_full.pdf) (Revision 2.2 as of Aug. 27, 2004). President Bush's new exploration plan is discussed later in this Note, *infra* Section V.B.

111. See generally NASA, 2 NASA'S IMPLEMENTATION PLAN FOR INTERNATIONAL SPACE STATION CONTINUING FLIGHT, available at [http://www.nasa.gov/pdf/56217main\\_stationCFT1.pdf](http://www.nasa.gov/pdf/56217main_stationCFT1.pdf) (Revision 1 as of Jan. 30, 2004).

112. See BST, ASSESSMENT AND PLAN FOR ORGANIZATIONAL CULTURE CHANGE AT NASA 3 (Mar. 15, 2004), available at [http://www.nasa.gov/pdf/57557main\\_Culture\\_Phase1\\_032904hi.pdf](http://www.nasa.gov/pdf/57557main_Culture_Phase1_032904hi.pdf).

113. *Id.* at 3-4, 6.

114. *Id.* at 3.

concern, perhaps, is the fact that employees do not feel comfortable raising safety concerns and other issues with management.<sup>115</sup> Using incremental steps, BST is currently helping NASA implement short-term changes in climate and long-term changes in culture.<sup>116</sup>

*C. Effects on the ISS: Progress Schedule, Support of Partners, and Safety Concerns*

The United States and its ISS partners are concerned about maintaining construction schedules, continuing research, and supplying the space station while the NASA shuttle fleet is grounded.<sup>117</sup> The only available transports are the Russian *Progress* cargo vehicles and three-passenger *Soyuz* crafts, which are poorly funded and insufficient to supplant the NASA shuttles that hold seven passengers and large quantities of fuel and payload (e.g., construction materials, instruments, and vital living supplies).<sup>118</sup> The ISS must remain manned despite these setbacks. The last shuttle mission to the ISS was *Endeavor's* Expedition 6 journey in November 2002, and the Russian *Soyuz* has continued to transport crews every six months since May 2003.<sup>119</sup>

Russia believes that Europe is the key to interim ISS survival since Canada and Japan cannot be counted on for sufficient aid.<sup>120</sup> The United States and Russia send permanent (meaning a full six-month shift) crew members to the ISS on each mission, while the ESA sends only visiting crew members that stay during the week or so of transport overlap.<sup>121</sup> There is hope that Europe will soon be able to send permanent crews as well.<sup>122</sup> The ESA fully supports NASA and the CAIB, and it will continue to send representatives to the ISS despite questions raised about the safety of manned space flight and the obvious need to revisit

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115. *Id.* at 3–4.

116. *Id.* at 5.

117. See O'Keefe, *Columbia's Legacy in Action*, *supra* note 7.

118. Anna Badkhen, *Russian Rockets Sole Path to Station: It Could Be Years Before Shuttles Return to Space*, S. F. CHRON., Feb. 5, 2003, at A17, reprinted in CDI RUSSIA WEEKLY No. 243, available at <http://www.cdi.org/russia/243-15.cfm> (CDI is the Center for Defense Information); Clara Ferreira-Marques, *Russia Urges US to Ditch Iran Qualms to Save ISS*, CDI RUSSIA WEEKLY No. 245, Feb. 20, 2003 [hereinafter Ferreira-Marques, *Save ISS*], available at <http://www.cdi.org/russia/245-4.cfm>; David Holley, *Russian Spacecraft Links Up to Station: With the Soyuz Now the Only Means of Ferrying U.S. Astronauts to and from the Facility, Talk Turns to Moscow's Funding Shortfall*, L.A. TIMES, Oct. 21, 2003, at A6.

119. See information about the ISS Expedition 6 crew and mission, and navigate by clicking each "Next Expedition Crew" link to read about successive crews and missions through the current Expedition 11, which was launched in April 2005 on a Russian *Soyuz* craft. NASA, Expedition Six Crew (et al.), at <http://spaceflight.nasa.gov/station/crew/exp6/index.html> (last visited June 12, 2005).

120. Ferreira-Marques, *Save ISS*, *supra* note 118.

121. For example, ESA Astronaut Pedro Duque launched with in-coming Expedition 8 crew on October 18, 2003, and returned with the out-going Expedition 7 crew on October 27, 2003. See NASA, Expedition 8 Crew, at <http://spaceflight.nasa.gov/station/crew/exp8/index.html> (last updated Apr. 29, 2004); NASA, Expedition 7 Crew, at <http://spaceflight.nasa.gov/station/crew/exp7/index.html> (last updated May 13, 2004).

122. Ferreira-Marques, *Save ISS*, *supra* note 118.

the IGA after the *Columbia* disaster.<sup>123</sup>

Unfortunately, there are additional concerns about the ISS beyond an impeded construction schedule and lack of manpower. Two NASA officials responsible for astronaut health dissented from the decision to launch Expedition 8 due to rapidly deteriorating health and safety systems.<sup>124</sup> Environmental monitoring devices have degraded to the point that air quality, water quality, and radiation levels are now impossible to assess.<sup>125</sup> These issues arose at a flight readiness review two weeks before the launch, but NASA officials decided that keeping the ISS manned outweighed the safety risks, and noted that evacuation was possible if conditions became hazardous.<sup>126</sup> The positive side to this situation is that the dissenters felt free to publicly voice their concerns, which is a check on NASA management that did not exist before the *Challenger* and *Columbia* tragedies.<sup>127</sup>

## V. WHY THE PUBLIC IS PAYING ATTENTION TO NASA ONCE AGAIN

### A. *The Mars Exploration Rovers: Spirit and Opportunity*

NASA's latest technological wonders caught the public eye and reinvigorated the U.S. space program in January 2004. The twin Mars Exploration Rovers—dubbed *Spirit* and *Opportunity*—successfully landed on Mars and transmitted images of its desert landscape back to geologists at the NASA Jet Propulsion Laboratory at the California Institute of Technology.<sup>128</sup> NASA's goal for this \$820 million unmanned mission is to collect geological information about Mars that might suggest it was once capable of sustaining life.<sup>129</sup> *Spirit* was launched from Cape Canaveral, Florida, on June 10, 2003,<sup>130</sup> landed on Mars on January 4, 2004,<sup>131</sup> and immediately sent images by radio signal.<sup>132</sup> The robot performed beyond expectation until a software problem slowed it down on January 22, just days before *Opportunity* was scheduled to land, but NASA identified and remedied the ailment.<sup>133</sup> *Opportunity* landed

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123. *Europe's Space Chief Backs NASA*, BBC NEWS, at <http://news.bbc.co.uk/2/hi/science/nature/3191543.stm> (Aug. 29, 2003).

124. *NASA's Hushed Debate*, *supra* note 7.

125. *Id.*

126. *Id.*

127. *Id.*

128. See generally NASA Jet Propulsion Laboratory, Mars Exploration, at <http://marsrovers.jpl.nasa.gov/home/index.html> (last updated Mar. 16, 2005).

129. Andrew Bridges, Associated Press, *Second NASA Rover Rolls onto Mars Surface* (Jan. 31, 2004), available at Westlaw, News & Business Library, AllNewsPlus File.

130. See NASA Jet Propulsion Laboratory, Mission Timeline: Launch—Archived, at [http://marsrovers.jpl.nasa.gov/mission/tl\\_launch.html](http://marsrovers.jpl.nasa.gov/mission/tl_launch.html) (last updated Mar. 2, 2005).

131. *Id.*

132. Press Release, NASA Jet Propulsion Laboratory, *Spirit Lands on Mars and Sends Postcards* (Jan. 4, 2004), available at <http://marsrovers.jpl.nasa.gov/newsroom/pressreleases/20040104a.html>.

133. Press Release, NASA Jet Propulsion Laboratory, *Two Working Rovers on Martian Soil*

halfway around Mars from *Spirit* on January 25, 2004, seven months after its launch from Earth.<sup>134</sup> NASA chose the two landing sites, an impact crater and an area rich in mineral deposits, because they “appear[ed] to have been affected by liquid water in the past.”<sup>135</sup> The rovers are programmed to drive up to forty meters per day while recording images and collecting mineral dust particles, and they continue to send data back to Earth after many months on the harsh Martian terrain.<sup>136</sup>

*B. President Bush’s New Exploration Plan: “A Renewal Spirit of Discovery”*

*1. The Details and Dollars*

With cheerful news of success in space diverting public attention from prolonged problems in Iraq, President George W. Bush seized the opportunity to introduce a new agenda for NASA, far-reaching in both time and scope,<sup>137</sup> just before the 2004 State of the Union address and an important re-election campaign. NASA’s budget request has hovered around \$15.5 billion for the past two years, which is roughly one percent of the federal budget (and less than what the Department of Defense annually spends on space), most of which goes into space flight support and solar system exploration.<sup>138</sup> The President requested \$16.2 billion for NASA in 2005 with an average \$0.5 billion increase in each of the following five years<sup>139</sup> to fund space probes to explore the lunar surface by 2008, a manned lunar mission and construction of a moon base by 2015, and an eventual manned mission to Mars.<sup>140</sup> He also wants to conclude NASA’s commitment to the ISS and, in conjunction, retire the space shuttle fleet by 2010.<sup>141</sup> President Bush’s five-year plan would divert \$11.6 billion from other NASA programs, including \$1.5 billion from the shuttle program, \$5.9 billion from current vehicle development to replace the shuttles, and \$1.2 billion from research on the ISS “that is not tied to the president’s new exploration vision.”<sup>142</sup> The budget for

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Expected by Saturday Morning (Jan. 30, 2004), available at <http://marsrovers.jpl.nasa.gov/newsroom/pressreleases/20040130a.html>.

134. Press Release, NASA Jet Propulsion Laboratory, NASA Hears from *Opportunity* Rover on Mars (Jan. 25, 2004), available at <http://marsrovers.jpl.nasa.gov/newsroom/pressreleases/20040125a.html>.

135. NASA Jet Propulsion Laboratory, Mars Exploration Rover Mission: Summary, at <http://marsrovers.jpl.nasa.gov/overview> (last updated Mar. 3, 2005).

136. *Id.*; see also NASA Jet Propulsion Laboratory, Update: *Spirit* and *Opportunity*, at <http://marsrovers.jpl.nasa.gov/mission/status.html#opportunity> (last updated Mar. 21, 2005).

137. Deagon, *supra* note 9.

138. Constance Adams, *It Doesn’t Take a Rocket Scientist*, POPULAR SCI., Feb. 2004, at 69, 74.

139. Brian Berger, *NASA Seeks \$16.2 Billion; Cuts Shuttle, Station, Next Generation Launch Tech Programs*, SPACE.COM NEWS, at [http://www.space.com/news/nasa\\_budget\\_040130.html](http://www.space.com/news/nasa_budget_040130.html) (Jan. 30, 2004).

140. Deagon, *supra* note 9.

141. *Id.*

142. Berger, *supra* note 139.

Mars exploration will increase by \$84 million to a total of \$691 million for 2005.<sup>143</sup> The Presidential Commission on the Implementation of United States Exploration Policy, whose task is to advise NASA on how to carry out the President's vision, consists of nine members from academia and the space industry<sup>144</sup> and is chaired by former Air Force Secretary and chief Pentagon weapons buyer Pete Aldridge, a current board member of Lockheed Martin.<sup>145</sup>

## 2. *Potential Benefits of the Bush Plan*

The highlights of this new plan are the renewed public fascination with space and the unquestioning belief that NASA can reach the moon again and beyond. President John F. Kennedy promoted similarly inspiring goals in the 1960s that resulted in the *Apollo* program.<sup>146</sup> The directive embraces the current NASA goal to build a replacement vehicle for the aging space shuttle, although the directive will shift money and efforts away from works-in-progress to something entirely new that will correspond to the moon and Mars efforts.<sup>147</sup> An often unpublicized benefit of further lunar exploration is the possibility of finding an energy source that could wean humans from petroleum dependence. One idea is to construct large solar power collectors on the moon that redirect energy to Earth.<sup>148</sup> Former astronaut Sally Ride, now a professor at the California Institute of Technology, foresees the extraction of natural resources such as oxygen and hydrogen from lunar soil.<sup>149</sup> Yet another abundant resource on the moon is the helium-3 isotope, described as a "near perfect fuel source: potent, non-polluting and causing virtually no radioactive by-product in a fusion reactor."<sup>150</sup> However, there is no timeline for when any of these fuels might become feasible alternatives to oil.

## 3. *The Surprising Turnaround of Sentiment Toward NASA*

After the release of the CAIB Report, Congress, the Bush administration, and the public questioned NASA's abilities and the future of the space program. The CAIB Report noted that the lack of

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143. *Id.* (stating that the \$691 million budget request for 2005 was "\$84 million more than it expected at this time last year").

144. Gwyneth K. Shaw, *Bush Names Panel on Space Study*, ORLANDO SENTINEL, Jan. 31, 2004, at A17.

145. Randall Mikkelsen, Reuters, *Bush To Outline Plan for Moon, Mars Exploration* (Jan. 14, 2004), available at [http://www.forbes.com/home\\_europe/newswire/2004/01/14/rtr1210009.html](http://www.forbes.com/home_europe/newswire/2004/01/14/rtr1210009.html).

146. Deagon, *supra* note 9.

147. Berger, *supra* note 139.

148. Kate Grusich, *First Woman in Space Says Travel to Mars Possible: Ride Optimistic About Space Program After Successful Landings on Red Planet*, CHI. DAILY HERALD, Jan. 28, 2004, at 4.

149. *Id.*

150. Jim Wolf, Reuters, *U.S. Eyes Space as Possible Battleground* (Jan. 18, 2004), available at <http://www.globalsecurity.org/org/news/2004/040118-space-battleground.htm>.

top-level governmental interest in the space program had even affected morale in the commercial space industry.<sup>151</sup> A few months later, the more glamorous Mars rovers diverted attention from the ugly internal problems at NASA. Why did Bush suddenly trust NASA with an infusion of money and responsibility before those internal issues had been properly addressed? The *Columbia* accident focused so much attention on NASA that the agency felt compelled to hastily reform itself.<sup>152</sup> This concerned employees inside NASA who felt that irreversible decisions may be made in this haste to the detriment of future generations.<sup>153</sup> It was schedule pressure in the first place that likely contributed to the unsafe culture and, ultimately, the *Columbia* explosion. To stick to a launch schedule for ISS construction, NASA accepted more and more risks, including the risk that the shuttles were safe to fly despite the known foam problem.<sup>154</sup>

According to NASA employees, the agency is structurally inefficient because there is no mentoring program for incoming young engineers, and it is difficult for project teams to access the central archives for research.<sup>155</sup> Without learning from experienced employees and the successes or failures of NASA's past, subsequent generations will continue to waste time redesigning programs that already exist or that were long ago dismissed as ineffective.<sup>156</sup> These layers of risk are compounded by the fact that NASA does not allow project teams to work together for very long before rearranging them, and it also does not take advantage of design solutions from the private sector.<sup>157</sup> Allowing more interaction and competition could remedy the slump in creativity and prove economically efficient.<sup>158</sup>

Even if President Bush's plan overreaches a bit for the current state of NASA, it has at least provided the engineers and architects with some focused, challenging goals. But are these goals attainable or just fantastical? Based upon empty promises and lack of vision by past presidents, notably the elder President George Bush,<sup>159</sup> the CAIB Report specifically noted: "It is the view of the Board that the previous attempts to develop a replacement vehicle for the aging Shuttle represent a failure of national leadership."<sup>160</sup> NASA answered the improbable challenge posed by President Kennedy in the 1960s,<sup>161</sup> but the agency is a much different and more bureaucratic place today. James Augustine, retired

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151. CAIB REPORT, *supra* note 92, at 103.

152. Adams, *supra* note 138, at 70.

153. *Id.*

154. CAIB REPORT, *supra* note 92, at 135, 139.

155. Adams, *supra* note 138, at 70.

156. *Id.*

157. *See id.*

158. *See id.*

159. Mikkelsen, *supra* note 145.

160. CAIB REPORT, *supra* note 92, at 211 (emphasis omitted).

161. *See id.* at 209.

chairman of Lockheed Martin and former head of a space program panel for the elder President Bush, compared the *Apollo*-era NASA work force to that of Silicon Valley in the 1990s—young, innovative, and creative.<sup>162</sup> Now the work force is much older and in need of more than just an interesting new project. As one of the first aerospace experts consulted by the current President Bush's exploratory commission, Augustine noted that the United States has traditionally underestimated the cost of large space projects, and he thinks that the money proposed by the President is not nearly enough to fund the moon-to-Mars vision.<sup>163</sup>

The CAIB Report noted a historical pattern by the government in expecting technological leaps from NASA without providing adequate funding. The Kennedy administration devoted substantial resources to the *Apollo* program beginning in 1961 because of the strong national interests in fighting the Cold War.<sup>164</sup> There have not been any similarly high-priority missions since the 1970s, so NASA now has to stand in line with the other agencies for budget handouts.<sup>165</sup> President Richard Nixon rejected NASA's ideas for a comprehensive post-*Apollo* space agenda in 1969, yet allowed a small amount of fixed funds to develop a transportation vehicle, resulting in the 1972 space shuttle program.<sup>166</sup> The administrations of Reagan and the elder Bush proposed initiatives to explore beyond Earth's orbit that were not adopted as national objectives by Congress, and President Clinton hoped that NASA could develop a new transportation system with more private than public investment.<sup>167</sup> Grandiose technological advances such as the ones called for by recent administrations come at a price, and the government has to be willing to put its money where its mouth is.

#### 4. *Thinly-Veiled Political Agendas*

Before the 2004 election year, President Bush showed no significant interest in space policy, and NASA was even publicizing its belief that there was no reason to send astronauts beyond low Earth orbit in the near future.<sup>168</sup> It seems that the Bush administration is being unrealistic in the face of an estimated \$500 billion deficit in 2004,<sup>169</sup> and a rising \$7

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162. Marcia Dunn, Associated Press, *Expert Warns NASA Can't Afford Mars Plan* (Feb. 12, 2004), available at Westlaw, News & Business Library, AllNewsPlus File.

163. *Id.*

164. CAIB REPORT, *supra* note 92, at 209. The *Apollo* program garnered NASA four percent of the federal budget, while NASA has received only one percent or less since that time. *Id.* at 102.

165. *Id.* at 209.

166. *Id.* at 11, 209–10.

167. *Id.* at 210.

168. *The Unknown: NASA's Course Highly Uncertain Despite Bush Vision*, HOUS. CHRON., Feb. 1, 2004, at Outlook 2, available at 2004 WL 57804929.

169. *See id.*; Joseph B. Verrengia, Associated Press, *Mars Critics Say Billions Are Ill-Spent* (Mar. 7, 2004), available at Westlaw, News & Business Library, AllNewsPlus File (estimating the national deficit to be \$477 billion).

trillion total national debt.<sup>170</sup> Many Democrats and media commentators believe that President Bush's announcement of the new space agenda was simply a strategic move to divert attention from an ailing economy.<sup>171</sup> Another Republican-friendly thread is that big businesses, such as aerospace industry leaders Boeing and Lockheed Martin, stand to benefit most from government contracts for the proposed missions.<sup>172</sup>

The possible military activities planned in conjunction with these missions to the moon and Mars may be disturbing to some. Treaties signed during the Clinton administration in 1996 committed the United States to solely peaceful uses of outer space, but President Bush's former defense secretary, Donald Rumsfeld, still staunchly supported more military technology in space.<sup>173</sup> According to the French space agency, the United States accounts for as much as 95 percent of global military space spending because it heavily relies upon satellites to collect information.<sup>174</sup> The military's interest primarily lies with sensors in orbit that could guide weapons or thwart missiles aimed at the United States.<sup>175</sup> A multi-layered shield to intercept missiles—the “Star Wars” project first proposed by President Reagan in the early 1980s—is being developed by the Pentagon, which plans to invest at least \$50 billion over the next five years.<sup>176</sup>

Although the space race is not as urgent now as it was in the 1960s, President Bush may have felt threatened by China's first successful manned space flight in October 2003 and its plans to visit the moon.<sup>177</sup> The abundance of the helium-3 isotope on the moon and its implications for the future of petroleum energy are no secret, and whoever reaches the moon first to mine it could potentially gain a monopoly on the source.<sup>178</sup> Despite the fact that the Moon Treaty does not allow appropriation of celestial bodies, the holder of the monopoly could name the price of that energy much as the Middle East dictates the price of oil.<sup>179</sup>

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170. Jonathan Nicholson, Reuters, *National Debt Tops \$7 Trillion* (Feb. 18, 2004) (on file with author).

171. *See id.*

172. Deagon, *supra* note 9.

173. Wolf, *supra* note 150.

174. *Id.*

175. *Id.*

176. *Id.*

177. *Id.*

178. *Id.*

179. *See id.*

## VI. WHY NASA'S INVESTMENTS SHOULD FOCUS ON THE NEAR FUTURE

### A. *Baby Steps: Short-Term Goals and Reform*

It is important for NASA to identify long-term goals like the moon and Mars missions, but immediate investment in those missions is unwise. The \$1 billion per year of "seed money"<sup>180</sup> devoted to NASA for President Bush's new plan would be better invested in other U.S. crises because, quite simply, failing to reach the moon in the next five years is no crisis. There is currently no pressing national interest or international space race. If money is going to be diverted from NASA's ongoing projects, it would be better spent on solving the oversight and structural problems within the agency. Because of the previous lack of interest and funding, NASA had to choose between either cutting programs or making the budget stretch more efficiently.<sup>181</sup> It chose the latter and took on the slogan "Faster, better, cheaper" in the 1990s, which only contributed to the ever-burgeoning mountain of safety and communication problems.<sup>182</sup> The newly increased budget must be used to counteract those years of degradation. After an environment conducive to communication, teamwork, and safety is reestablished, work should proceed on designing a replacement for the vulnerable space shuttle.<sup>183</sup> New vehicle technology is an important initial step toward creating a rocket powerful enough to take humans to the moon again, as did the now retired *Saturn V*.<sup>184</sup>

### B. *Honoring U.S. Commitments to the ISS and Taking Full Advantage of the Space Laboratories*

The United States serves as project manager for the ISS and has an obligation to its partners to give full attention to that position until construction is complete. The space station program manager for NASA, William Gerstenmaier, said he expects that at least twenty-eight more shuttle missions will be necessary to reach "international core complete," the point at which all U.S. obligations are satisfied.<sup>185</sup> Although all shuttle flights will be dedicated to the ISS until then,

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180. David J. Eicher, *Despite Far-Reaching Goals, NASA Benefits Earth Most*, USA TODAY, Jan. 22, 2004, at 15A.

181. CAIB REPORT, *supra* note 92, at 103.

182. *See id.*

183. The CAIB Report explains that the shuttle fleet could last until the year 2020 and beyond if NASA will implement the recommended "recertification" process, which would entail a thorough examination of each shuttle when its actual utilization exceeds its original design life. *See id.* at 209.

184. *See Deagon, supra* note 9.

185. Broward Liston, Reuters, *NASA: Shuttle Flights to Look Like Business As Usual* (Jan. 23, 2004), available at <http://news.lycos.com/wired/story.asp?section=CatalogSearch&storyId=816857> [hereinafter Liston, *NASA: Shuttle Flights*].

President Bush wants NASA to finish the ISS and retire the shuttle fleet by 2010.<sup>186</sup> That ultimatum may be unreasonable. ISS project deadlines are continuously delayed because the Russian *Soyuz* and *Progress* crafts cannot fill the void of the much larger U.S. shuttles, and the earliest possible shuttle flight is July 2005.<sup>187</sup> In addition, the partners are constantly faced with malfunctions on the ISS: environmental systems are degrading; exercise equipment vital to astronaut health is breaking;<sup>188</sup> and a slow leak was found after too many astronauts used a hose as a handhold while looking out of an observation window, thereby cracking it.<sup>189</sup> Most recently, the primary oxygen generator on the ISS was in disrepair and the resident astronauts began to run out of oxygen and food; however, the next Russian cargo vessel was not scheduled to launch for another three months.<sup>190</sup> This is a perfect example of how desperately the ISS needs U.S. shuttles to supplement the Russian ships and bring adequate amounts of supplies to sustain the astronauts.

President Bush wants NASA to limit its research on the ISS to his administration's space exploration goals, including the impact of long-term space travel on humans.<sup>191</sup> While that is certainly one potentially fruitful area of research, it is myopic and a disgraceful underutilization of the ISS. Considering the immense work undertaken by the United States to plan and build the space station with its international partners, NASA should continue to do research that can improve life on Earth. Humans are more likely to find a cure for cancer in the beneficial antigravity environment of the ISS than to build a hotel on Mars in the next few decades. President Bush's plan forces a schedule upon NASA, much as past administrations have done to the detriment of the NASA culture and the crews of the *Challenger* and the *Columbia*. The first launch since the *Columbia* tragedy has already been pushed back multiple times due to NASA's unflinching resolve to implement the CAIB recommendations before another launch, as well as to hurricanes and other problems beyond human control. There are too many unpredictable elements in space flight for the government to establish hard and fast schedules or expectations, and it should have patience if it

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186. *Id.*

187. There seems to be no end to the delays. Hurricane damage to NASA facilities throughout the Gulf Coast region in September 2004 pushed the schedule beyond the March/April 2005 window, leading to the previously anticipated May 2005 date. Mark Carreau, *Storms Delay Shuttle Launch*, HOUS. CHRON., Oct. 2, 2004, at A13, available at 2004 WL 83669887. Then, after possible ice damage to space shuttle *Discovery's* heat shields delayed the May 2005 launch at the last minute, NASA set a new July 2005 date to correspond with the next available window. Guy Gugliotta, Reuters, *Shuttle Deemed Ready for July Launch*, WASH. POST, June 9, 2005, at A03, available at LEXIS, News, Washington Post File. These continued delays may prove detrimental to the construction schedule and crew safety on the ISS. See *supra* Section IV.C.

188. O'Keefe, *Columbia's Legacy in Action*, *supra* note 7.

189. Liston, *NASA: Shuttle Flights*, *supra* note 185.

190. Associated Press, *Mission to Space Station Called Vital: NASA Says Russian Ship Must Bring Oxygen, Food by Christmas*, WASH. POST, Sept. 25, 2004, at A2, available at 2004 WL 93178763.

191. Mikkelsen, *supra* note 145.

truly wants to improve safety practices at NASA, which is crucial to developing successful new technology.

The United States has an obligation not only to the international community, but also to its own space industry. President Bush is willing to disregard the millions of dollars and years of time that NASA, academics, laboratories, and companies have already spent on preparing ISS projects.<sup>192</sup> Former U.S. Senator John Glenn—the first American astronaut to orbit the Earth—believes that Bush’s plan “pulls the rug out from under our scientists who placed their faith in NASA.”<sup>193</sup> He also thinks that using the moon as a “steppingstone” to Mars is ill-advised because of unpredictable costs and complications.<sup>194</sup> Also, should NASA voluntarily end all of its ISS projects besides those on human physiology, other ISS partners may capitalize on the abandoned research. While new technologies that might emerge from such research would benefit all of mankind, those other nations would receive the recognition and profits that rightfully belong to the United States and its scientists.

The fact being ignored by many is that NASA’s greatest contributions are not to space, but to everyday life on Earth. The “ripple effect” of NASA research—practical technology growing out of space technology—provides humans with useful goods ranging from cellular phones to ski jackets.<sup>195</sup> If those materials can be produced here on Earth, then there are amazing possibilities for developing new materials in the antigravity of space. There are visions of major medical and industrial breakthroughs that would improve and prolong life on Earth.<sup>196</sup> Those practical realities are arguably more important than sending a person to Mars. The ISS was once the great dream of NASA, and this must not be so easily tarnished by the Bush administration’s political agendas.

### *C. Encouraging Private Investment Through Reform in Space Patent Laws*

Insiders at NASA believe that allowing more private interaction and competition will boost creativity and efficiency on projects, as well as save money.<sup>197</sup> Many private companies already clamor to win contract bids,<sup>198</sup> and a few also contribute experiments to the ISS.<sup>199</sup> NASA needs

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192. See Reuters, *Glenn Criticizes Bush’s Mars Proposal*, L.A. TIMES, Mar. 4, 2004, at A29, available at LEXIS, News, Los Angeles Times File.

193. *Id.*

194. See *id.*

195. See Eicher, *supra* note 180.

196. See generally Verrengia, *supra* note 169.

197. See Adams, *supra* note 138, at 72.

198. *Id.*

199. For a list of experiments conducted on the ISS during Increment 6, Mission 11A, among others, see [http://spaceresearch.nasa.gov/research\\_projects/ros/increment2.html#6](http://spaceresearch.nasa.gov/research_projects/ros/increment2.html#6) (last visited June 12, 2005) (navigating via experiment links illustrates that some experiments are sponsored by private entities like Intel and Stanford University).

to take advantage of the immensely talented and economically thriving private aerospace industry by providing more incentive to invest in the ISS. Incentive comes in the forms of opportunity and profit, the latter depending on patents. It would be easy for NASA to relax its own rules on private interaction, but international space patent laws need to be reformed.

As previously discussed, the United States and NASA have made efforts over the years to allow more private patent rights in what were traditionally governmental arenas. The NASA Act of 1958 gave patents on all items produced by joint ventures between NASA and private entities to the federal government.<sup>200</sup> Then, the 1990 Patents in Space Act was passed to ensure that U.S. patent law would govern space activities by NASA and domestic industry, unless limited by a controlling treaty.<sup>201</sup> NASA also managed to find a way around the strict NASA Act by entering into Space Act Agreements with private companies or by simply waiving patent rights and taking a license or a future interest in abandoned patents.<sup>202</sup> These actions are incompatible with the global focus of international treaties,<sup>203</sup> which grant patent rights to the nations owning the ISS modules where the inventions are made, not to the nations of the inventors. The treaties should be revised to recognize the participation of private companies around the world and reward them for their efforts, regardless of on whose module they are working. If partner nations were allowed to assign patent rights to the most deserving parties, even with limiting criteria, they could eliminate their distracting roles as license managers. Minor amendments to the international treaties could rectify the current stifling regime for patents in space and jumpstart the desired commercialism of the ISS.

## VII. CONCLUSION

It is unwise for NASA to discard ongoing research and initiatives in favor of the Bush administration's new plan, which is backed by questionable motives. The one problem NASA does not have is a lack of vision. NASA independently created the Mars rovers project long before the Bush administration announced its plans for Mars, which proves that the agency can juggle new projects along with established ones such as the ISS and vehicle replacements. ISS research should not focus solely on the means necessary for deep space exploration by humans, and the shuttle fleet should not necessarily retire when the ISS core construction is complete. People can more immediately benefit from ISS research on medicine, materials, and other Earth-based technology than they can from deep space exploration. If NASA can

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200. See 42 U.S.C. § 2457(a) (2000).

201. See 35 U.S.C. § 105 (2000).

202. See OGC Guide, *supra* note 55, at Part II.A.4.

203. See Shoemaker, *supra* note 62, at 419.

transform itself with the help of the CAIB and BST, the space shuttle program will safely last as long as necessary for NASA to develop a sufficient vehicle replacement to transport crews and supplies to the ISS. Efforts should also be made to encourage private investment in space activities and persuade the ISS partners and the UN to revise the current regime for patents in space. If the government wants NASA to make great technological strides, it must invest patience and proper funds in the agency to prevent schedule-induced pressure and potential disasters. Only then can NASA truly flourish.