Barriers to Space Enterprise

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Abstract

Barriers to space enterprise not only pose serious risks to the advancement of space commerce, but they discourage fresh ideas, enthusiasm, and capital. Many of these barriers originate with United States policies, laws, and regulations which have been evolving since the late 1960s. This paper, therefore, discusses the various barriers to space enterprise resulting from key policy, legal, and regulatory items. In addition, the Office of Associate Administrator for Commercial Space Transportation, the office that regulates commercial launches in the U.S, is highlighted in the discussion. The Strom Thurmond National Defense Act is also examined as it is responsible for several of the more recent barriers to space commerce. Not only does this act affect important business aspects of American satellite companies, but university students and commercial space companies are adversely impacted, especially in their use of the low-cost Russian Dniepr launcher.

Conflicts within U.S. government agencies and Congress are discussed as barriers to space commerce result from the actions of these organizations. Financial and market uncertainties are also discussed as they make commercial space ventures more risky and are certainly barriers to commercial space development. Misperceptions, many of which originate from official U.S. policies as well as statements made by authorities and leaders in the commercial space industry are examined as well.

In addition to the discussion regarding the existing barriers to space commerce, this paper points out that a potential barrier to space enterprise that may arise from the lack of business ethics in the commercial space industry. If an ethical approach to space development is not established, the commercial space industry runs the risk of attracting excessive government regulation which will certainly be a barrier to the industry.

This paper concludes by offering some suggestions for minimizing the effect of the existing barriers and for eliminating future barriers. A recommendation is also offered to those in the commercial space industry to supervise their own conduct when engaging in space commerce to avoid unnecessary government regulation.

Introduction

Space commerce barriers serve to limit the space venture's profit potential by creating uncertainty and added risks in related financial markets. These barriers can also force the would-be space venture to withstand a costly and time-consuming bureaucratic process, often resulting in launch delays or other problems. Any one of these effects may damage or destroy the space venture's chances for success.

Despite the existence of space commerce barriers, space enterprise has a successful thirty-four-year track record, dating back to the launch of *Early Bird*, the first commercial satellite. Since then, commercial space ventures have grown and profited to an impressive degree, leaving little doubt that space businesses can be profitable. To support this conclusion, several noted publications documenting the success of the commercial space industry are referenced in this paper.

While the success of the commercial space industry is well established, its continued success is threatened due to the existence of significant barriers to space enterprise. Many of these barriers can be traced to U.S. government policy, laws, and regulations. Some of the key barriers resulting from these issues are also discussed in this paper.

In addition, this discussion focuses on the Department of Transportation's (DOT) Office of the Associate Administrator for Commercial Space Transportation (AST). The AST

regulates commercial launches in the U.S. and is the source of many of the delays encountered by commercial space companies in obtaining launch approvals. The AST's regulatory requirements are identified in this discussion.

The discussion regarding U.S. laws singles out the Strom Thurmond National Defense Act of 1998. This act is responsible for creating significant barriers to space commerce, especially with the satellite industry. Restrictions on the usage of low-cost Russian Dniepr launchers are also discussed as the Strom Thurmond Act has made it harder for Americans to use these rockets, while in other parts of the world Dniepr use is growing.

U.S. government agencies and Congress also create barriers to space enterprise. Jurisdictional as well as intra-and interbureaucratic conflicts often result from agency and Congressional action concerning space matters. This type of action fosters confusion and often causes delays or even the termination of a commercial space project.

In addition to the barriers resulting from government action, this paper examines space commerce barriers resulting from financial and market uncertainties concerning commercial space ventures. Misperceptions about commercial space ventures also result in barriers, especially since many of these perceptions are even encouraged, though not always intentionally, by the very policy makers who regulate space commerce.

If the public believes that there is an absence of an ethical commercial space industry, a new space commerce barrier may arise in the form of restrictive or excessive government

regulation regarding the public's concerns. Commercial space development is already a low priority item for most people. If the public perceives that space is being developed unethically, or if the business models being exported from the Earth to low Earth Orbit (LEO), the Moon, or an asteroid resemble the worst traits of our present day businesses, there is every likelihood that there will be a clamor for government regulation to either control or stop such practices. Ethical space commerce policies should be implemented by the space industry now, when it is relatively easy to create safeguards and initiate self-policing actions. By adopting such policies, a potential barrier to space commerce can be avoided.

Recommendations for minimizing the effect of the existing barriers and eliminating new barriers are offered in this paper. It is worth noting that one of the best ways to avoid future barriers is to continue to point out the success of the commercial space industry as well as the ways in which this industry has benefited people around the world. Success, along with the recognition of the benefits people enjoy from space commerce, make the best case for continued commercial space development unfettered of barriers.

Space commerce barriers also exist as a result of the United Nations treaties regarding outer space, in particular the Outer Space and Moon treaties. However, these barriers are better discussed in the legal presentations and papers that were part of the Cato Institute's conference *Space: The Free-Market Frontie*r held on March 15, 2001. As such, they are not discussed in this paper.

Space Enterprise Has a Successful Track Record

Confirming the success of the commercial space industry to date is important for it demonstrates that space commerce can be and already is a profitable industry with a huge potential for future growth. Several esteemed publications independently have confirmed the success and potential of this industry and are noted the following paragraph. Seeing this industry continue its growth and profitability, not only for the benefits that space development has brought to people, but also for its employment and economic contributions is important.

Reporting on the success of the commercial space industry, KPMG Peat Marwick, in its report *1997 Outlook: State of the Space Industry,* put global operating revenues for the satellite industry at $62.2 billion for 1996 and forecasted global operating revenues of $106.6 billion for the year 2000.[1] Merrill Lynch, in its *Global Satellite Marketplace 99,* projected the industry to increase from an estimated $36 billion in 1998 to $171 billion by the year 2008.[2] In addition, C. E. Unterberg, Towbin, in its quarterly publication *The Satellite Book,* stated in the second quarter 1999 issue that the commercial satellite industry is estimated to grow from a $54.8 billion industry in 1998 to an estimated $116.3 billion in the year 2003.[3]

There is little doubt that the commercial space industry can continue to grow and prosper, especially if barriers don't hinder its future. However, space commerce barriers can and

do adversely affect space commerce. The following discussion examines several of the space commerce barriers.

U. S. Government Policy As a Barrier to Space Enterprise

U.S. space policy can play a significant role in space commercialization. Several documents and policy statements have been signed into law and articulate this nation's space policy. In this section, barriers arising from three important formal space policies are examined.

The National Space Transportation Policy (NSTP) was signed into law by President Clinton on August 5, 1994. The NSTP was largely based on the *Access to Space* report by NASA and the *Space Launch Modernization Plan* of the Department of Defense (DOD). Thus from the outset, the NSTP was "steeped in intra- and interbureaucratic bargaining and self-assessment."[4]

Relationships within government organizations and agencies, such as those upon which the NSTP was designed, can often lead to confusing policy, especially for commercial space matters. For example, the NSTP provides that the departments of Transportation (DOT) and Commerce (DOC) should promote creative arrangements between the public and private sectors. There is also an interagency working group representing the DOD, the DOC, the DOT, NASA, and the intelligence community which is to make certain that a commercial voice is heard throughout the process of designing a new launch vehicle.

Unfortunately, barriers to space enterprise often result from the actions of these agencies as they are not always in harmony with one another regarding space policy. This situation has been documented by Joan Johnson-Freese and Roger Handberg in their book *Space: The Dormant Frontier*. In this book, the authors clearly state that the NSTP often fails to obtain cooperation or coordination between the DOD, NASA, and the other agencies for they only cooperate superficially.

In addition to the NSTP, the United States has another formal, documented national space policy requiring approval by the president. The National Space Policy of 1996 does not even mention private investment in outer space in any of its stated goals.[5] While the actual text of the National Space Policy of 1996 does contain a reference to space commercialization, this minor reference only appears halfway through the document.[6] The low priority that space commerce receives in this important space policy document has the potential to be a barrier to space enterprise. Businessmen and women want to know that the nature of the investments they are making are important and when official government policy downplays the importance of such investments, the investment can be discouraged or even halted.

NASA's *Strategic Plan* of 1998 only has a minor reference to the commercialization of space. At the beginning of the text is a section entitled "Administrator's Strategic Outlook." In this section the NASA administrator references six areas of interest as NASA priorities. Commercial space ventures are briefly mentioned at the end of the last area of interest.[7]

Barriers to space enterprise result from the way these important space policies treat space commerce. One can readily conclude that commercializing space is not a high priority for the United States government. Such a conclusion can lead the business community and ordinary citizens to devalue private enterprise in space.

U.S. Laws and Regulations As Barriers to Space Enterprise

Laws and regulations often conflict with one another in their attempt to regulate space commerce. These same laws and regulations more often than not require a business to go through a cumbersome process when applying for permits, licenses, and approvals for a launch or space venture. This part of the discussion looks at some of the main pieces of legislation affecting space commerce, giving rise to many of the barriers faced by space businesses. Sorting out these potential conflicts can be both costly and time-consuming, and can ultimately deter space commercialization.

Initially, the Federal Aviation Act of 1958, which created the Federal Aviation Agency (FAA), imposed limits on states to legislate commercial air travel. At that time, commercial space travel, including commercial rocket launches, was not envisioned. By the time the Commercial Space Launch Act of 1984 (CSLA) was passed into law, the commercial space industry was already a financially successful and growing industry. The CSLA further defined the federal licensing mechanism for space businesses, but this act also provided for states to regulate space launch activities within or affecting their

jurisdictions.[8] This authority seemed to conflict with the authority of the FAA in regulating launches.

Also in 1984, President Reagan created the Office of Commercial Space Transportation (OCST) within the DOT largely because of the confusion that came about after the first private launch of the *Conestoga I* in 1982.[9] At that time, Space Services, Inc. had sought permission to launch a privately built booster rocket for a suborbital test flight. The company had to obtain approval from five different federal agencies through a process that took six months and cost in excess of $250,000 in legal fees. By 1986 the OCST was issuing regulations to govern launches by private companies, but it was not until after the *Challenger* accident that the office became a key agency for both space policy and space commercialization.[10] The FAA, which is also part of the DOT, was already involved in regulating public and private launches because all of the launches were, and still are, subject to FAA regulations in American airspace. Eventually government policy gave the OCST the clear mandate to be the primary agency for regulating and supervising private launches. When it was initially created, the OCST identified at least a dozen federal bureaus, as well as states and other districts, that could have some jurisdiction in regulating space activities.[11] Even with the mandate given the OCST, various federal bureaus and states retained an influential position in regulating space activities, thus giving rise to many of the problems affecting space enterprise today.

The Commercial Space Act of 1998 resolved much of the confusion that may have resulted from either the authority or regulations of the FAA, the CSLA, and the OCST.

This act clearly granted authority to the FAA for the licensing of the launches and landings of space vehicles. In fact, prior to the passing of this act, companies could not legally land a launched vehicle in the United States. This fact contributed to the decision made by Kistler Aerospace to develop additional launch facilities in Australia, where such regulations did not exist. The Commercial Space Act of 1998 is an important law since it permits RLVs, when they are developed, to both launch and land within the United States.[12]

The AST

In November 1995 the OCST became the Office of the Associate Administrator for Commercial Space Transportation (AST) and was transferred to the FAA. The AST, the only space-related office within the FAA, became the regulatory agency in charge of commercial launches. In its role of regulating the commercial launch industry, the AST has developed numerous regulations to govern commercial launches. Listed below are some of the AST regulatory requirements for conducting a commercial launch in the United States:

1. Licensing and safety requirements for operation of a launch site.
2. Commercial space transportation reusable launch vehicle and reentry licensing regulations
3. Financial responsibility requirements for licensed reentry activities
4. Commercial space transportation licensing regulations
5. Commercial space transportation financial responsibility requirements for licensed launch activities
6. Reusable launch and reentry vehicle system safety process guidelines
7. Expected casualty calculations for commercial space launch and reentry missions.
8. Site operators license applicant information
9. Supplemental application guidance for unguided suborbital launch vehicles

10. Agreement for Waiver of Claims and Assumption of Responsibility
11. Environmental licensing requirements to comply with the National Environmental Policy Act
12. Required environmental documentation, including environmental impact studies.[13]

Environmental Policy and the AST

The environmental issues pertaining to a launch can be significant. As such, the AST assists the launch industry in complying with federal environmental laws and regulations. Since the AST is supportive of commercial space activities, despite the problems associated with it and its regulatory process, commercial space companies would rather deal with the AST on environmental issues rather than with another arm of the federal government. Still problems exist. A case in point concerns Kistler Aerospace, developer of the K-1 reusable launch vehicle (RLV). Kistler proposed to launch its K-1 RLV from the Nevada Test Site, which is a federal launch facility in the Nevada desert. The AST required meetings with local interested parties and the Indian tribes to discuss whatever issues these parties may have considered to be of concern regarding the K-1 launch. An environmental assessment was prepared and was under review by the FAA.[14] Complying with this environmental process can mean delays and increasing costs for the launch companies. Not all commercial space companies would be able to cope with these requirements.

The AST and Launch Approval Delays

The slowness of getting a launch approval from the DOT's AST can be costly to

businesses. In the following example, the AST sat on the launch request too long for this particular company thereby causing the company to be ineligible for a chance at winning the Cheap Access to Space (CATS) contest. Space businesses can become impaired by the AST's bureaucratic restrictions resulting in a loss of business as well as opportunity. Furthermore, if the launch is going to require the use of federal launch or tracking facilities, there could be significant red tape.

J. P. Aerospace (JPA) of Rancho Cordova, California, a would-be satellite company, was planning to enter the recent CATS contest. This contest offered a $250,000 prize for the first team to launch a 2-kilogram payload to 200 kilometers (124 miles) above the Earth on or before November 8, 2000. JPA intended to launch its entry from Nevada's Black Rock Desert. The other two contestants, Danish Space Challenge of Højbjerg, Denmark, and High-Altitude Research Corporation of Huntsville, Alabama, planned to launch their entries from Greenland and the Gulf of Mexico, respectively. Only JPA was to launch in the U.S. JPA had submitted its application for the necessary licenses, permits, and approvals to the AST in May 2000, but the AST informed JPA in late September 2000 "that it considered the application incomplete."[15] The AST told JPA that it would take up to two months to further study and act on a revised application.

JPA had also requested a waiver from obtaining a launch license for the CATS prize. The AST can grant a waiver for the launch of an unguided suborbital launch vehicle if the launch takes place from a private site and involves a rocket that meets three specific conditions: motors with a total impulse of less than 200,000 pound-seconds, motors that

have less than 15 seconds of operating time, and a ballistic coefficient of less than 12 pounds per square inch.[16] The AST denied JPA's waiver request. In addition, JPA was required to furnish details of the rocket and motor design, along with an analysis of what the vehicle would do in flight and what the likely outcomes would be if it failed. JPA was also required to work with FAA regional flight centers to make sure that the air-traffic controllers were aware of the launch.

As it turned out, High-Altitude Research Corporation's entry, which was launched from the Gulf of Mexico, outside U.S. regulated territory, failed to reach the stated orbit. Danish Space Challenge ran out of money and was unable to secure additional financing for its launch vehicle; thus, it never made it to the contest. Had it not been for the delaying actions of the AST, JPA might have won the CATS Prize. The administrator of the CATS Prize, David Anderman, was unwilling to extend the deadline for the contest past November 8, 2000, because a primary purpose in offering the prize was to encourage the launch teams to successfully negotiate and overcome obstacles in the bureaucratic process.[17] JPA was unsuccessful in overcoming the AST's obstacles.

The Strom Thurmond National Defense Authorization Act

New barriers to space enterprise have arisen as a result of the Strom Thurmond National Defense Authorization Act of Fiscal Year 1999, passed by the 105th Congress and signed into law on October 17, 1998. This law established new policies for export controls on missile technology and commercial satellites, especially with respect to China.[18] In

essence, this act transferred the authority over export controls on commercial satellites from the DOC to the Department of State (DOS), effective March 15, 1999. Some commercial satellites had previously been designated as dual-use technology, requiring that the license application be coordinated with the DOS to ensure that military technology would be protected. It is also important to note that export control over commercial satellites was years ago under the auspices of the State Department, but because of numerous complaints about the slow and lengthy approval process, satellite export control was moved to the DOC.

Two and one half years after the passing of this law, new problems with the DOS have emerged that either prohibit or seriously delay export approvals. Problems have even arisen that concern the ability of an American company to communicate and share company information with its offices in a foreign country. Because of these problems and the deleterious effect this law is having on U.S. satellite and space businesses, Representative Howard Berman, a Democrat from California, plans to introduce a bill in the House of Representatives later this year that would transfer satellite export authority back to the DOC.[19]

The Strom Thurmond National Defense Authorization Act gave significant new responsibilities to the Defense Threat Reduction Agency. These responsibilities involve overseeing the license application, all international meetings, and foreign subcontractor communications pertaining to satellite export matters. In addition, this act contains an

unusual provision requiring those commercial space companies wishing to export their products to pay all the related agency expenses, travel, and overhead.

The Dniepr Example

Another barrier resulting from the Strom Thurmond National Defense Authorization Act concerns the Treaty on the Further Reduction and Limitation of Strategic Offensive Arms (START II). This particular barrier discourages the use of a low-cost alternative launcher for small payload scientific, educational, and commercial missions. According to the terms of this treaty, Russia must either dismantle and scrap several hundred of its SS-18 ballistic missiles, or it can convert and sell them for use in launching scientific, educational, and commercial missions. By using a converted SS-18, known as "the Dniepr," the cost for launching a satellite to LEO is approximately $12–25 million, compared to $50–75 million using a similar commercial launch vehicle, but the launch must take place within Russia. These more affordable launch costs and the small payload capacity make the Dniepr a desirable vehicle for satellite programs sponsored by universities across the country. Already the Dniepr has been used for several such launches of university satellites in various countries, and the worldwide demand for the Dniepr is growing. Russia is also profiting from Dniepr launches, given that its START II obligation would otherwise compel it to scrap the rockets if they were not being sold for these small payload launches.

Unfortunately, in the United States, use of the Dniepr is a more complex issue than in other countries. The Strom Thurmond Act applies to the launching of university satellites using a Dniepr because the satellite must be exported to the Russian launch site for the Dniepr launch. American universities have to overcome significant bureaucratic hurdles to secure a Dniepr launch, while their counterparts in other parts of the world have no such obstacles. In addition, most satellite technology that university satellite projects use is often derived from basic textbooks, yet it still falls under the jurisdiction of the satellite export and technology control laws. Universities cannot always afford to engage in the regulatory and approval process required to be able to use a Dniepr. The difficulties faced by an American university using a Dniepr create an additional barrier to space enterprise to the degree that the education of American students interested in outer-space commerce and satellite development is hindered by not having access to an affordable launch vehicle for student satellite projects.

The Start II Treaty also permits the Dniepr to be used for commercial projects. Again, however, because of the limitations imposed by U.S. law, a small commercial satellite or launch company would most likely find using a Dniepr too difficult. If the company could not afford to use another commercial launch vehicle at a substantially higher cost, it would simply be unable to move forward with its venture.

This Dniepr example points out the extent to which American businesses and future space industry leaders are hindered by U.S. laws, regulations, and policies. The long

reach of these barriers can extend to college students, even to advanced high school students, as well as to commercial space companies.

U.S. Government Agencies and Congress

The role of government agencies in regulating commercial space businesses is different from that of Congress. There are potential jurisdictional conflicts between agencies and even between departments within these various agencies. These conflicts can increase the costs for businesses operating in space.

Examples of these jurisdictional problems abound. For instance, with the DOD, businesses may have to deal with several different offices representing all the military services and often they are not in agreement with one another. Within the DOC, there are organizations that have legal jurisdiction over certain issues and projects, all of which can affect the commercial space businesses. Two examples of departments within Commerce that can have this impact are the National Oceanic and Atmospheric Administration (NOAA) and the National Telecommunications and Information Agency (NTIA). As stated by Dr. Phillip R. Harris, a noted space psychologist and author, "Instead of coordinating space regulations for business, the opening of space offices in various federal agencies has only complicated bureaucratic actions."[20]

Financial and Market Uncertainties of Commercial Space Ventures

The obvious lack of both strong public- and private-sector financing in commercial space ventures is a problem. Having access to key financial markets is important for any business, but especially important for commercial space ventures. While financing for satellite telecommunications projects is now commonplace, space ventures that differ from the telecommunications model often scare investors. The recent financial problems of Globalstar and the collapse of Iridium and ICO have led to higher financing costs for space ventures. These problems have also reinforced the belief that space must be extraordinarily expensive. Furthermore, public-sector programs in the form of tax incentives and credits, as well as loan guarantees, are not yet available. These assistance programs, if properly structured, could help private space companies to acquire funds for qualified projects while providing a positive return to the government if the venture is successful. In the absence of such programs, financing issues can be a powerful barrier to space enterprise

Another barrier to expanding space commercialization is the uncertainty associated with the probable markets for NSIs. The inability to accurately determine the extent to which a market for space tourism exists, for example, is a barrier to financing such ventures. Most of the investment community considers the research on space tourism and other NSIs to be suggestive of "wild guesses and backed by surprisingly little research."[21] Space tourism would be better served by more practical market research that would earn

the respect of the investment community. Working with credible, practical market research is important as it helps to eliminate both market uncertainties and associated risks which can be barriers to space commerce.

Misperceptions about Commercial Space Ventures

Misperceptions about space commerce also cerate barriers to space enterprise. The barriers caused by misperceptions especially limit the progress of space commercialization. Misperceptions are the most insidious barriers to space commercialization because they often influence the preliminary thoughts about a project. A good example of this is the perception that space has to be expensive. Most in the private sector believe that our current space program and NASA projects are costly because space is and always will be costly. Seldom does one understand that these projects are costly because of the specifics of the program. The perception that all space has to be expensive is difficult to change since businesses and investors look to the government, NASA, and the aerospace industry for almost everything to do with space. In addition, the public is constantly reminded by the government and the media of just how expensive and risky space is, especially with failed NASA missions to Mars, Shuttle difficulties, and International Space Station (ISS) cost overruns. In fact, many people simply accept that the price for sending people to space on a typical Space Shuttle flight costs between $500 million and $750 million. What people don't know and what they are not told is just how out of date and inefficient the Space Shuttle is, and just how cost effective a new-generation RLV could be if one were developed. Most people are also

unaware that commercial projects in LEO are less costly than a NASA Space Shuttle mission.

Another example of a barrier resulting from a misperception is the Russian plan to send Dennis Tito to their module on the ISS as a space tourist on April 28, 2001. The European Space Agency, the U.S. government, and NASA believe that it is too risky and too costly to send a space tourist to the ISS. These organizations also believe that since the ISS is publicly funded, the public needs to have its investment protected from civilian space travelers. When such announcements are made by these venerable agencies and the government, the vast majority of the public, including businessmen and-women, solidify their perception that space is too expensive, too risky, and only for the government and its approved astronauts. This is a barrier that requires significant education to overcome. It would also help if a different attitude existed in the government and within national space agencies about space commerce and who can actually be an astronaut.

Yet another misperception arises from the public statements made by leading aerospace company executives regarding well-known commercial projects. A good example of a misperception caused by a public statement concerns Lockheed Martin's VentureStar RLV based on the X-33 design that won the July 1996 NASA competition. By 2001, NASA planned to have funded about $1 billion for fifteen X-33 test flights. Lockheed Martin was supposed to then use the technology developed from the X-33 project to build its full-size, privately owned version of the RLV, the VentureStar. Both Lockheed and NASA promoted the VentureStar as the next-generation RLV, but both also disclosed the

existence of difficulties in continuing the project. On May 21, 1999, Peter B. Teets, president and chief operating officer for Lockheed Martin, told the U.S. Senate Commerce and Science Committee that the project was unsuccessful in attracting Wall Street investors "and would need some form of added government funding or loan backing."[22] It was the first time the company admitted that the VentureStar could not be developed and made operational using only Lockheed's financial resources.[23] Teets went on to say: "Wall Street has spoken. They have picked the status quo—they will finance systems with existing technology. They will not finance VentureStar."[24] These are powerful statements for the chief executive officer of one of the leading aerospace companies to make, but they only tell a portion of the story. Such statements have the potential to negatively influence the perceptions of key people in the financial industry and government, affecting more than just VentureStar. This is even more so now that NASA has officially terminated the X-33 and Lockheed its VentureStar project.

The problem lies in what is not being told to Wall Street investors, Congress, and the public. In reality, many experts doubted that VentureStar could be built or made to perform as specified. VentureStar critics were quick to point out that the design and engineering problems were specific to VentureStar, not to RLVs in general. In fact, Dr. Bruce B. Lusignan, director of Stanford University's Communication Satellite Planning Center, has been working on an RLV design which, according to his analysis, will be both highly economical to operate and have superb performance characteristics. Many entrepreneurial RLV companies make similar positive statements about their RLV designs. It is important, therefore, to separate the RLV industry from VentureStar and its

problems. Unfortunately, this does not usually happen when a well-known aerospace executive makes statements that have the potential to hinder the entire RLV industry.

Ethical and Behavioral Considerations for Commercial Space Ventures

As we start this new century, we note that many of our successful businesses seem to be concerned only with the bottom line, often to the exclusion of basic human needs and a reasonable distribution of resources. Although they usually operate within the law, these businesses do not always value their moral and ethical responsibilities to the consumers, let alone the public in general. In the not-too-distant future, expanding our economy to LEO, the asteroids, and the Moon will begin a new era of industrialization in space. Many questions remain as to what this LEO-and-beyond economy will look like, especially the settlements which are sure to follow.

One of the most important concerns that we can resolve before this era of space industrialization is in full swing involves the standards that our LEO and spaced-based businesses will project. The business standards for ethics that we export to outer space will be with us for many years to come as our new space economy develops, expands, and eventually seeks independence from its source here on Earth. To have a say in the moral component of the new space economy and to help avoid unwanted regulatory barriers to space commerce, we need to be addressing these issues now, and even more important, we need to get the business community involved.

The failure to consider the ethical standards for our businesses operating in space carries with it the potential of a new era of space regulation. As we begin this new century, there is no shortage of pressure on terrestrial businesses regarding their ethical standards and behavior. There is no reason to believe the same won't be true for commercial space businesses. If the commercial space industry falls short in policing itself with regard to these issues, then there is a risk of more space industry regulation. To assure that space commerce does not become subject to restrictive or excessive regulation regarding ethical issues, the space industry should implement its own ethical standards less the industry finds the government doing it for them.

CONCLUSION

It is important for government regulators and interested parties to realize the economic potential as well as the benefits that can result when space commerce is not damaged by barriers. This is an important first step in furthering space enterprise. For space commerce to prosper, the barriers must be minimized, simplified, or eliminated. As much as possible, barriers to space enterprise must not become part of new laws and regulations affecting space commerce. By understanding the consequences of these barriers and the way they handicap business opportunities in space, we can effectively work to ensure that such barriers become a thing of the past.

Space is usually viewed by governments and militaries as their domain. As such, these public organizations don't want to relinquish their control over who and what goes into space. Applying constructive pressure to government officials and elected representatives is helpful. Vigilance, however, will be required at every step along the way as the regulatory forces are strong and many nations with diverse interests and priorities want to be part of the space economy.

Successful commercial space ventures make powerful statements and strongly support the case for eliminating or reducing the space commerce barriers. As we move forward into a new era of space expansion and commercialization, eliminating bureaucratic, legal, and financial barriers should be a priority. In addition, the commercial space industry must understand that its actions and behavior need to reflect an acceptable ethical business standard. Otherwise, the industry runs the risk of bringing on an era of unprecedented regulation regarding its commercial space development activities.

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