Economic and Societal Benefits of Peace In Space: Today and Tomorrow

By

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(oral presentation[1] by Marcia Smith)

Corinne and I both were close friends of Eilene and spent many hours talking with her about this, that, and the other, but each of us noticed over the last year or so of her life that Eilene was focused on one issue: telling people about all the benefits that we get from space that would be imperiled if space became a venue for conflict.

She lamented the fact that space was taken for granted, and believed with all her heart that if people just understood what was at stake, no one would want to put weapons in space.

Eilene wanted this symposium to focus on that topic – the peaceful uses of outer space and why peace must be maintained to benefit the people of Earth. So the paper that we have written is very much influenced by Eilene's ideas and beliefs. The words are ours, but the voice is hers. And as Linda Billings stated so clearly at Eilene's memorial service a few months ago, if Eilene had one message to leave all of us, it would be "Don't mess with the Outer Space Treaty."

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[1] The full paper is available on Marcia Smith's website SpacePolicyOnline.com.

Most of the people in this room know the Outer Space Treaty by heart, so I will not spend much time reviewing its provisions about peaceful uses. Suffice it to say that it is the basic legal framework for international space law.

Article I preserves the fundamental principle of freedom of exploration and use of outer space by all states.

Article II forbids any government from claiming sovereignty in space.

Article III reiterates that "exploration and use of outer space" will be carried out "in accordance with international law…"

The key arms control provisions are in Article IV that

- **prohibit nuclear weapons or other weapons of mass destruction from being placed into Earth orbit or on the Moon or any other celestial body, and**
- **prohibit military bases or installations, the testing of weapons of any kind, or the conduct of military exercises on the Moon and other celestial bodies.**

Article VI and VII state that countries exploring space are responsible and liable for any damage their activities may cause and that nation-states bear responsibility for all activities in outer space, including those conducted by non-governmental entities and all activities require "authorization and continuing supervision by the appropriate State Party."

Article IX requires states to "conduct all their activities in outer space with due regard to corresponding interests of all other States Parties." If one State

Party believes that the activities of another "would cause potentially harmful interference" "appropriate international consultations" can be called for.

Preserving peace in space has enabled its utilization to flourish. Virtually all of the inhabitants of planet Earth in countries large and small, developed and developing, benefit from satellites designed for communications, navigation, and remote sensing, and the technological developments that underpin space activities.

We also benefit from the scientific knowledge about our home – Earth – and its place in the solar system and the universe. The increasingly international character of space activities is another benefit that manifests itself through improved relationships among countries. A price tag cannot be placed on such intangible aspects of peaceful uses of space, but they are no less important.

A thriving multibillion-dollar "space economy" has grown over the past 50 years and in 2008 was valued at $257 billion according to the Space Foundation's "Space Report 2009."

Our paper contains more details about the components of the Space Economy as enumerated in that report, and it also cites analysis by the OECD and the U.S. National Research Council that emphasizes that while the space industry is small relative to other manufacturing sectors "... its dynamism in terms of innovation and R&D, and its significance, gives it importance beyond its size," quoting the OECD.

A thorough discussion of the peaceful uses of space is outside the scope of our paper, but we briefly describe some of the benefits from communications, navigation and remote sensing satellites. The Space Enterprise Council and the Marshall Institute held a series of three meetings where speakers talked about "A Day Without Space" – what would happen if suddenly satellites were not available. The transcripts of those meetings are available on the Marshall Institute's website and make for very interesting reading.

We have a rather long quote in our paper from Ed Morris, then at the U.S. Department of Commerce, on what would happen if there were no communications satellites. Here's a sample of what he said:

> **Our long-distance phone calls go through satellites. TV entertainment, both live and recorded, is routinely relayed from studio to station via satellite. Even your local news channels use satellites to deliver live reports on location. Without space, we would lose all of this.**
>
> **In regions where there is no terrestrial infrastructure, such as rural Africa or China, telecommunications would be impossible.**
>
> **International financial transactions would be disrupted.**
>
> **Our embassies would lose their ability to communicate securely with Washington,**

In short, it would not be a good day.

Navigation satellites are also part of our critical infrastructure and their uses are ubiquitous. The U.S. Global Positioning System (GPS) is by far the best known and frequently used Positioning Navigation and Timing system in the world.

The Space Report 2009 estimates revenue from GPS equipment and services in 2008 at $56 billion a year.

Noting that GPS timing signals are used for everything from coordinating and managing telecommunications networks to the electrical grid and financial systems, the National Research Council concluded "From that perspective, the entire economy relies on the space infrastructure."

"Remote sensing" covers a broad range of space applications that use satellites to look down at Earth producing images or collecting data that feed into weather forecasts or climate studies, for example. According to The Space Report 2009, it was a $7.5 billion market in 2008. Though that market is much smaller than communications or navigation, remote sensing satellites are a crucial national and international resource. As Ed Morris noted at that "Day Without Space" symposium, for example,

> **… If a natural disaster occurred on a hypothetical day without space, we would have no ability to photograph it quickly from space and assess the damage.**

Space programs also are a driver of new technology development. While initial technology developments are designed to enable or enhance space missions, they often have secondary uses that were not envisioned at the time of the development – spinoffs. There are many critics of claiming economic benefits from space program spinoffs on the basis that the technologies, if needed, would be developed anyway or that it is often impossible to trace the heritage of a technology purely to a space activity. Nonetheless, the more than 1,600 technologies catalogued in NASA's Spinoff books over the years cannot be easily ignored.

The benefits of space exploration and utilization that are enabled by maintaining peace in space are not all about money. Peace in space also yields societal benefits such as expanding our knowledge of the universe, fostering international cooperation and good will, and inspiring people throughout the world about limitless possibilities.

The images from the Hubble Space Telescope and the rovers on Mars are probably as well known throughout the world today as the Apollo landings on the Moon. The data from space science missions open our minds and inspires us to seek more knowledge – perhaps even to discover whether there is other life "out there."

Eilene often commented that after an initial reaction of shock to the Soviet launch of Sputnik, members of the United States Senate were relieved when scientists who were involved in the International Geophysical Year told them about the peaceful uses of outer space and "Fear of war changed to hope for peace." Space science could hardly have a more dramatic impact than that.

Maintaining peace in space also permits human space flight missions. Many have tried to articulate the value of human trips into space, but most find it difficult to explain why such expensive undertakings are worth the cost and risk.

In 1989, President George H.W. Bush announced a new program to return astronauts to the Moon and then go on to Mars and may have said it best

> **Why the Moon? Why Mars? Because it is humanity's destiny to strive, to seek, to find. And it is America's destiny to lead.**

Obviously he was speaking to an American audience!

Critics of human space flight argue that robotic missions are cheaper and do not risk human lives. That is true. Nonetheless, the pride and prestige and inspiration associated with human space flight has not diminished with the passage of time as demonstrated by the 36 countries that have sent their representatives into space.

Both space science and human space flight missions involve strong international cooperation today.

NASA has pursued international cooperation for all of its 51 years as encouraged by Section 205 of the 1958 National Aeronautics and Space Act. As I'm sure many of you know, Eilene was instrumental in getting that section into the law. Eilene strongly believed that by working together in space activities, countries would be drawn to work together on other critical issues and hence facilitate world peace.

On a more practical level, international cooperation enables some space programs that are too expensive for one nation alone to pursue.

As for the future, maintaining peace in outer space will open new opportunities for governments and the private sector to explore and utilize space for the benefit of all.

Our paper describes two illustrative examples of potential future benefits from space: energy and tourism.

Very briefly, two future candidates for feeding the world's insatiable appetite for electrical power require access to space: Space Solar Power Systems (SSPS) and nuclear fusion. SSPS has been studied for several decades and

would use solar arrays in Earth orbit, lunar orbit or on the lunar surface to collect solar energy and beam the power back to Earth. Considerable research also has been done on fusion reactors and one promising fuel is helium-3, which is scarce on Earth but comparatively abundant on the Moon.

One of the challenges for mining helium-3 will be establishing a governance structure for utilizing lunar resources. Some argue that the Outer Space Treaty inhibits commercial activities on the Moon because companies cannot own property there. Yet a burgeoning commercial marketplace exists in Earth orbit even though companies cannot own orbital slots or frequencies. Perhaps the IISL could focus one of its sessions on how to establish a mechanism – perhaps modeled on the ITU or WTO -- for determining permissible uses of the Moon on an international basis.

As for space tourism, the unveiling of Virgin Galactic's SpaceShipTwo this past Monday may open additional opportunities for ordinary people to fly into space. More than 300 passengers reportedly already have paid deposits. That would be a good business for Virgin Galactic, but the greater benefits may come from affording so many inhabitants of our Pale Blue Dot the opportunity to see our planet from that new perspective.

Regulatory and governance issues will be important for this commercial space activity, too. As pointed out by Dr. Kai-Uwe Schrogl of the European Space Policy Institute in recent testimony to the U.S. Congress it is important for the international space community to work to prevent countries that do not want to adhere to international norms from acting as "flags of convenience." A review of space tourism regulations in the United States and elsewhere and an identification of issues that remain to be resolved could be the topic of an IISL session at a future colloquium.

In conclusion, it is essential that the Outer Space Treaty remains in force and continues to provide the fundamental tenets to preserve peace in space. Additional agreements may be required to clarify specific points, or new governance mechanisms may be needed for lunar resource utilization, for example, but the Outer Space Treaty stands the test of time.

By contrast, if space becomes a venue for conflict, all the benefits that we obtain from space now and the future will be imperiled.