



POLICY FORUM ON SPACE SETTLEMENT

A Pre-Conference Event of the
International Space Development Conference

Sheraton Pentagon City Hotel
Arlington, VA

June 5, 2019
9:00 AM – 5:15 PM

AGENDA WITH ABSTRACTS

8:30 AM

Registration Opens

9:00 AM

Opening Remarks

Dave Dressler, NSS Conference Committee Chair
Steve Wolfe, Deputy Executive Director, SpaceCom, Forum Chair

9:45 AM

Keynote:
\$1 Trillion Space Economy to Support Space Development

Patrick Sullivan, Deputy Director, Regulation and Policy, Office of Space Commerce, U.S. Dept. of Commerce

9:35 AM

What is a Space Settlement on the Moon, Mars and Free Space?

Joshua Izenberg, COO and General Counsel, OffWorld
AI Globus, Senior Research Engineer, San Jose State University

Abstract

What exactly is a space settlement and where can they be built. Who will live in them and how big a population can that support? To provide clarity and context for the Policy Forum on Space Settlement, Jim Keravala and AI Globus provide overview of technologies and architectures for the Moon, Mars and free space large scale permanent human habitats, or space settlements.

10:15 AM

Featured Speaker:

Declaration of Human Rights in the Universe – Empowering the People of Earth to Settle Space While Protecting Critical Locations and Habitats

Rick Tumlinson, Founding Partner, SpaceFund

Abstract

The purpose of this paper is to offer a clear, simple and concise top level guiding document that can inform international and national policy development related to human actions and interactions beyond the Earth.

International polices and codes of conduct in place today were created before the concept of individual human beings establishing settlements and communities and private industrial activities in space was understood to be more than the realm of science fiction. The prime documents providing the overall framework for today's policy discussions are both outdated and lacking, in terms of providing a realistic and long term framework for an expanding human civilization to both explore and settle the space frontier.

A new top level document needs to be adopted that can inform all other humans-in-space related polices in the millennia to come. The Declaration of Human Rights in the Universe accomplishes this by adopting the basic precedents of such documents as the Universal Declaration of Human Rights, the Outer Space Treaty and other applicable historic credos, while articulating the new reality of an open frontier that is owned by no one, belongs to everyone and is open to all.

10:30 AM

Break

11:00 AM

Session Topic:

How Current Space Law Encourages and Inhibits Space Settlement Development

Moderator: James Muncy, Principal, PoliSpace

Making Space Settlement a National Goal

Dale Skran, Chair, NSS Policy Committee

Aaron Osterle, Acting Executive Director, Space Frontier Foundation

Abstract

This paper will make the case for establishing space settlement as a U.S. national goal. To be meaningful, such a long term goal must require that the relevant federal agencies, especially NASA, are aligning their current research activities in support of it. Supporting activities would include the preparation of a detailed roadmap, however broadly drawn at first, that will inform technology development programs. A reporting requirement on progress being made toward space settlement is also important to help keep agencies focused on the stated goal. This paper will review past and present legislative initiatives to establish the goal of space settlement and how such legislation could be improved upon.

Does the Outer Space Treaty Prevent Human Settlement of Mars?

Laura Montgomery, Ground Based Space Matters, LLC

Abstract

Interpretation and implementation of the Outer Space Treaty raises many questions of *first impression*. This means that all the scholarly articles, all the different position statements from federal agencies, all

the wishes of space pioneers, have not been put through the crucible of litigation, and no judge has rendered a decision as to the accuracy of those interpretations.

This means that because a question of *first impression* is one where no binding legal authority controls the answer, we may interpret the Treaty so that it does not unduly burden private activities in outer space. There are three controversial provisions of the Treaty where the three different branches of the U.S. Government could interpret ambiguities in favor of commercial operators. They include Article II's prohibition on national appropriation of outer space, including the Moon and other celestial bodies, Article VI's call for the authorization and continuing supervision of non-governmental entities in outer space, and Article IX's requirement that States Parties pursue their studies and exploration of outer space so as to avoid harmful contamination to outer space and adverse changes in Earth's environment resulting from the introduction of extraterrestrial matter. Advocates from academic and governmental institutions have argued that these provisions bar commercial ownership of property in outer space, require governmental authorization and supervision of all private activities in outer space or prohibit private U.S. activity without that authorization and supervision, and that the harmful contamination provisions apply to private actors. These interpretations are burdensome, unnecessary, and incorrect.

Emerging Space Law Trends and Space Directives Analysis

By James Wolff, Esq., Vice President, Orbital Assembly Corp.

Abstract

Adapted from Mr. Wolff's Lawline CLE course on Space Law and Policy, this session will examine and analyze issues related to Space Settlement from a regulatory and legal perspective. More specifically, proposed examinations include for examples such as future proposed stand-alone medical hospitals and clinics in orbit and in deep space, proposed stand-alone observatories in space, proposed large-scale multi-national space stations, and proposed sub-tenancy commercial establishments such as restaurants, offices, entertainment venues, and commercial trading market stock floors which would interact and coordinate with asteroid mining companies, bio-medical technology companies producing products in orbit, and other such operations applicable to commodity futures transactions, and trading. The lecture will also analyze the trading implications and hypothesized characteristics based on the envisioned thousands of metric tons of raw materials hypothesized to be mined and returned to Low Earth Orbit by private commercial space companies and sovereign nations between 2030 across the Earth-Moon gravity well. Another example would be the examination of Public Private Partnerships as they relate to space settlement considerations with respect to investment and capitalization of the future LEO/GEO space settlement ecosystem. The lecture will also touch upon the related synergies between a progressive approach to Space Settlement policies and the existing and declared objectives of the United Nations Sustainable Development Goals and 2030 Agenda and related objective metrics analysis. Also covered are regulatory development trends, and the lecture will extrapolate potential future legal paradigms as they relate to space settlement considerations including housing, careers and employment, sovereignty rights, and will conclude with a list of suggestions for programs, initiatives, projects, and future studies to enable space settlement development by private and public efforts.

12:00 PM

Luncheon Keynote: Where We Are Headed?

Robert Walker, CEO, MoonWalker Associates / Member of Congress, 1977-1997

1:45 PM

Featured Speaker:
The Human Space Program: A Central Project for Humanity

Frank White, Author, The Overview Effect, The Cosma Hypothesis

Abstract

Seeing the Earth against the backdrop of the universe (“The Overview Effect”) has provided humanity with a unique symbol of unity as a context for our diversity. As the experiences of the astronauts have filtered into the culture, we can see a new way forward for a planet confronted with multiple challenges. However, as we move out into the solar system, do we risk losing that unity? What can supplement the Overview Effect as we become a multiplanet species? In this session, Frank White presents the concept of a “Human Space Program,” a central project for humanity spanning then millennium and designed to draw on the best talents of all the astronauts of Spaceship Earth as we explore the universe together.

2:00 PM

Session Topic:
Potential Government Incentives for Private Funding of Space Settlements

Moderator: Hoyt Davidson, CEO, Near Earth LLC

Public-private capital solutions in support of long-term Space development and settlement

Jason Aspiotis, CEO, Finsophy

Abstract

Airline subsidies, the Overseas Private Investment Corporation (OPIC), and the Federal National Mortgage Association (FNMA or “Fannie Mae”) were established in the 20th century to support private enterprises and capital markets in development of America’s airline industry, housing market, and foreign policy in emerging economies. This talk will provide an overview of the applicability of similar public-private financial solutions in support of private Space travel, infrastructure development, and eventual space settlement.

Extending Real Property Rights To Celestial Bodies

Rand Simberg, Consultant on space technology, business, regulation and policy,

Abstract

Property rights are a sine qua non of a market economy, and under English common law they have been refined to create an economic engine in the West and elsewhere that has lifted billions out of poverty in the past two centuries. Without them, particularly for real estate, it is difficult to work the land for profit, and impossible to transfer ownership, to borrow against the land, or to pass the land on to one’s beneficiaries.

But the ability to own titled land, including mineral rights, on other planets has been rendered problematic by some interpretations of Articles II and VI of the Outer Space Treaty of 1967. The former forbids claims of “national appropriation,” and thus national sovereignty, and the latter requires “continuing supervision” by States parties to the agreement of its persons’ activities in space. It has been argued that the combination of the two essentially forbids individual property rights on the celestial bodies covered by the treaty, including the Moon and Mars.

However, the fundamental principle of that treaty, per Article I, is that space is the “province of all mankind,” whereas the failed Moon Agreement of 1979 declares that it is the “common heritage of all

mankind.” Many, even delegates to the recent Legal Subcommittee meeting of COPUOS in Vienna, use the phrases interchangeably, but they are in fact very different in their legal implications.

The Trump administration has declared that space is not a commons, and that “province of” implies that the treaty is “permissive” of a wider range of activities than 20th-century interpretations have allowed for. It will be argued that multi-lateral international agreements are possible within it to make not just Mars, but the entire solar system safe for English common law and other regimes of private property rights, allowing it to be developed and settled, just as the home planet has been.

Effective Space Taxation Policy Today Can Increase Investment in Space Settlements

Robert Aillon, Chief Executive Officer, Leviathan Space Industries

Abstract

As the long-term growth of the space industry appears solid through the next several decades investing in the space industry may be one of the better long-term opportunities. Understanding the realities of current and future market challenges, as well as how to navigate through to them will be key. Space Settlements will be an accelerating facilitator for permanent human presence in the solar system. However, the current system allows access to space only for the uber wealthy instead of being universal. So how can we make investing in the Space Settlements mainstream, so it replicates the stability and structure that has been successful in the efficient and sustainable real estate market of the United States?

This paper will discuss how the benefits of an effective space taxation policy can offer the various rewards to the multiple industries, including banking and insurance sectors as well as institutional and individual investors. The goal is to unite various earthly capital resources and markets into participating into a fluid evolving Space Settlements program which will project humankind into the solar system.

The vision requires humankind to develop long-term timeframes, reconcile the expectations of investors and capital returns, provide visibility into the space industry, and provide access for liquidity for companies as well as investors. Visibility, access and liquidity for innovation and investors will allow for the long-term survivability and confidence of both parties, the innovating enterprise and the capital provider.

Our position is to facilitate a flexible taxation policy on Space Assets that will result in providing access to average investors and capital markets to invest in the Space Industry companies developing Space Settlements. This will provide much needed capital for space companies which need the funds for innovation and growth. At the same time the investor should generate assets which appreciate over the long-term with incentives to bequeath them to the next generation tax free. The success of this market adoption, including having the proper incentives can result in significant industry growth and capital reward. In this case, through an effective Taxation policy the United States workforce should benefit from job growth and investors should benefit from wealth creation.

2:45 PM

Session Topic: Changes to international Law to Enable Space Settlement Development

Moderator: Greg Autry, Director, Southern California Commercial Spaceflight Initiative

An International Lunar Decade: Paving the Way for Sustainable Space Settlement

Jim Crisafulli, Chair of Aerospace States Association Space Committee, Chair of National Space Society Lunar Affairs Subcommittee

Abstract

Launching an International Lunar Decade (ILD) from 2020-2030 could help inspire public-private partnerships and multinational alliances to facilitate cost-effective and sustainable human settlements on the Moon. The ILD concept was inspired by the International Geophysical Year, which (from July 1957 through December 1958) engaged 67 nations to promote multinational collaboration in research to enhance understanding of global phenomena (like climate change). An ILD was first proposed to UN COSPAR by the Planetary Society in 2006, and was originally scheduled to commence on the 50th anniversary of the IGY in 2007. But the global financial crisis that emerged that year impacted space priorities - cancelling programs targeting the Moon. Now the U.S. and other space-faring nations are again planning lunar missions; and unlike 2006, there is now significant involvement by the private sector with plans to utilize lunar resources - as well as fuel depots and other facilities in cislunar space. This paper will explore ways in which an ILD could provide a flexible temporal framework for coordinating initiatives independently organized by countries, commercial firms, universities, and international organizations, leading to sustainable research and commercial activities on and around the Moon that could help reduced the costs, enhance the benefits, and accelerate timetables for future space exploration, development and settlement.

Closed for Operations: Non-Interference Zones and the Cadence of the New Space Race

Chris Hearsey, Founder & CEO, OSA Consulting, LLC

Abstract

This paper will explore the concept of non-interference zones for space activities and how this concept produces an inevitable constraint on policy and decision makers planning future space activities. Generally, non-interference zones are volumes of space around spacecraft and/or space activities determined by a set of criteria that creates a location or relative position of exclusivity for the operator. The murky question of whether this idea is in accordance with the outer space treaty system and/or US law and policy is gaining some clarity. And while the legal considerations are important, the realities of physics and mathematics place a limitation on the flexibility of the criteria for non-interference zones to handle the proliferation of new operators and activities, and this raises the important question about the degree of exclusivity that is permissible and expected. This issue will have major implications for future mission and architectural designs and set the development cadence of space settlement on a celestial body. Adjusting to the space environment will be key to ensure successful operations on the Moon or other celestial bodies, but the physical limitations of the space environment highlight the need to keep discussions surrounding the cadence of this new space race ongoing because, eventually, we will run out of space.

The Amazing Utility of Customary International Law for Space Development

Alfred Anzaldúa, NSS Executive Vice President, Chair of NSS Policy Committee

Abstract

Even without negotiating another international space treaty, we can establish international space law through multilateral practices, including national proclamations, declarations, activities, and legislation. Law established that way is called "customary international law." Such law emerged long ago in the maritime context and is beginning to emerge in the space context. By promoting national guidelines, norms, and legislation based on best practices by private industry, we can simultaneously deal with major space issues, such as the growing threat of orbital debris, while laying the groundwork for

customary international space law that can be codified eventually by international treaty. However, to effectively carry out such actions, we must also deal with thorny issues of property ownership and liability raised by international space treaties. Yet, by so doing, and especially by avoiding the "liability quagmire," we will thus be able to facilitate the international collaboration needed for humanity's expansion into the solar system and beyond.

Code of Behavior in Space

Michelle L.D. Hanlon, Associate Director of the Air and Space Law Program, University of Mississippi

Abstract

Our evolution into a spacefaring species, with single and then multiple human communities off-Earth, is a human necessity. Assuring the sustainability and success of those communities requires the development of guidelines and principles that recognize space as a place, and not a legal regime.

We are experiencing a paradigm shift in how activities are conducted in space. Space actors are no longer just governments. And soon, humans in space will not all be government employees or contractors. Elon Musk has promised to send a spacecraft of civilians around the Moon, and more than one company is exploring the establishment of a private space station for use as a hotel. Not only will we have civilian tourists in space, we will have civilian workers to cater to their needs. Addressing on-orbit torts and crimes through the current space treaty regime would lead to jurisdictional absurdities and even diplomatic morass.

This paper proposes that the advent and proliferation of space tourism should be the mainframe from which we, as a society and global community, consider the regulation of extraterrestrial human civilization. The presentation advocates for the establishment of a Code of Conduct containing principles and guidelines designed to govern the activities and behavior of humans in space. The Code will be loosely modeled on the Code of Conduct for the Space Station Crew developed pursuant to the International Space Station Intergovernmental Agreement. However, rather than the individual remaining the responsibility of his or her national or sponsoring government, the individual shall be responsible for his or her own actions. The presentation will outline the substantive terms of the Code of Conduct which, it proposes will be adopted by national governments and implemented through national regulatory regimes.

Establishing a Code of Conduct will lay the foundation for a universal law, Astrolaw, in anticipation of the commonality of humans living, working and vacationing in space. It will support and sustain the success of extraterrestrial human communities. It will help prevent unnecessary conflict – which may, because of State responsibility for nationals in space, easily rise to diplomatic crisis. And it will thwart the threat of dystopian tyranny on these private pockets of human civilization. Finally, it will assure the safety of the hardy souls that venture into space as private citizens and work responsibly to develop international guidelines that will prevent disasters, without stifling commercial industry, innovation and exploration.

Crowding at lunar sites of interest: Possible ways forward

Dr. Alanna Krolkowski, Assistant Professor of Political Science, Missouri University of Science and Technology

Dr. Martin Elvis, Astrophysicist,

Dr. Tony Milligan, Faculty, Department of Theology and Religious Studies at King's College London

Abstract

A growing number of public and private actors from different countries are planning missions to a handful of sites of interest on the Moon. These attractive locations, including the Peaks of Eternal Light and other sites at the lunar poles, are few and small. Different actors, pursuing distinct goals and possibly in tension with each other, appear poised to access, modify, and create installations in these finite spaces, creating the risk of crowding. Crowding increases the risk of overuse and misuse of these sites, which

could inflict irreversible losses of opportunity upon science, settlement, and commercial programs. Managing crowding at these sites thus presents a pressing governance challenge. This paper explores strategies and mechanisms for the management of activities at such sites by new and diverse actors over the next two decades. The paper develops several scenarios for how this challenge might be overcome: a government-led approach, an industry-led approach, and a hybrid arrangement. We evaluate the advantages and disadvantages of the different scenarios and, based on this analysis, propose near- and long-term policy recommendations.

4:00 PM

Session Topic:

Proper Role of Government in Space Settlement Development: Quarterback, Cheerleader, Coach, or Owner?

Moderator: Aaron Oesterle, Acting Executive Director, Space Frontier Foundation

Proper Role of Government in Space Settlement Development

Tony DeTora, Former Senior Professional Staff, House Committee on Science, Space, and Technology

Abstract

What is the proper role of government as humanity takes steps towards Space Settlement? Settlements into new frontiers in the past have taken a variety of approaches with varying levels of success. What approach will work best for the unforgiving space frontier? The author analyzes different potential approaches, identifying strengths and weaknesses of each approach with regard to Space Settlement, and makes recommendations on the best policy for the role of the government.

A Space-STEM Education Model for Developing a Global Space Settlement Workforce

Sam Ximenes, CEO, WEX Foundation and Exploration Architecture Corp

Abstract

Inspiring the next generation of space explorers is an essential aspect of space settlement development. A Lunar Caves Analog Test Sites (LCATS) space-STEM education model is applied to inspire students to engage in space settlement by attaching project-based space-STEM learning experiences to actual technology, engineering and science investigation challenges associated with various site development growth phases of a specific space settlement initiative. The model framework aligns the student learning experience with mission priorities for planetary surface systems engineering and mission operations, science experiments and science instrumentation, and allows students to freely advance ideas for technology concept investigations. A proposed global collaboration component of the model between participating international space communities using international student exchange programs can be implemented through national space agency policy directives in support of the education element of the space settlement initiative. The formation of a global network of space-STEM education communities concurrently engaged in a unifying mission objective of advancing space settlement research and technologies enables a pathway for a global space settlement workforce. In turn, public benefits are seen in the advancement of STEM education leading to job creation, industry expansion to include secondary space sector support industries, and the evolution of the space based market. This can facilitate potential government incentives for private funding of space settlements, and spill overs in global economic health through international collaboration. Through project-based space-STEM learning experiences a robust, multi-generational, international space settlement workforce for the future can emerge.

Working Around a Gridlocked Congress: The Unexplored Frontier of State Government Support for Space Activities

Sean Hadley, Associate Director, New Jersey Education Association

Abstract

In an era of unpredictable action from Congress, participants in the space economy should turn to state governments for resources and policy solutions. The burgeoning space industry promises to transform state and regional economies, and state and local officials are often eager and accessible partners in finding practical solutions to vexing policy problems. What's more, multi-state consensus often paves the way for Congressional activity. This presentation will propose a novel approach to consensus building and its potential application for space settlement development.

Near Term Research Priorities that will Enable ELEO Space Settlements

Al Globus, Senior Research Engineer, San Jose State University

Abstract

This paper explores the policies that, should they be followed, would greatly enable the first space settlement in equatorial low Earth orbit (ELEO).

Policy and project requirements include:

1. A series of missions to verify radiation levels in ELEO computed by Oltaris
2. Investigation of the South Atlantic Anomaly to see if it may move onto the equator
3. Space hotel development
4. Financial incentives for space settlers
5. Support for necessary technical developments including:
 - a. launch to LEO
 - b. space farms
 - c. Implications of living in a large rotating environment, including variable-g plumbing
 - d. long-life space construction techniques
 - e. recycling techniques for all or all or nearly all items
 - f. supporting software development, mostly open source

Advancing Space Settlements with the U.S. Commerce Department

Nathaniel Snyder, JD Candidate 2020, The University of Mississippi School of Law

Abstract

The future of space is commercial. For space settlements to become economically sustainable, the government must foster the growth of the space industry. Congress should enact a law that grants the Department of Commerce jurisdiction over commercial space activity, excluding communication through spectrum use and national security concerns.

The Department of Commerce can best promote industry while ensuring the United States authorizes and continually supervises space activities as required by international law. Under the proposed law, Commerce will supervise every stage in a space settlement's lifecycle from development to licensing and operation. The law will assure property rights to settlement operators of the ground underfoot if

settlements are established on celestial bodies. The ASTEROIDS Act, introduced in 2014, provided similar assurances to resources obtained in space.

The next provision will grant broad authority for settlement operators to enter into public-private partnerships and hybrid agreements with prior-approved state actors. It's crucially important for space settlements to have access to expertise and technology found overseas. This continues the trend of relaxing export controls. The provision also empowers private actors to follow in the footsteps of the International Space Station and establish settlements with multiple states cooperating in one structure.

The final provision will govern the licensing of space settlements. A streamlined application process will guarantee applicants response within six months of filing. One license will encompass all launches that support the approved settlement. Commercial launch licenses already operate similarly under the Commercial Space Launch Act.

Domestic oversight – not international cooperation – is the only regulatory framework capable of keeping pace with the ever-changing needs of the space community. The Department of Commerce has an internal culture best situated to help commercial settlements flourish. Space settlements are best served by Commerce and industry working side-by-side to continually refine regulations that foster growth.

4:45 PM

Policy Leaders' Reaction to Forum Proposals

Moderator: Steve Wolfe, Deputy Executive Director, SpaceCom

James Dunstan, General Counsel, TechFreedom, Founder, Mobius Legal Group, PLLC

James Muncy, Principal, PoliSpace

Jeff Greason, Chief Technical Officer, Electric Sky, Chairman, Tau Zero Foundation

Description

A panel of policy experts will digest and reflect on the papers presented during the day. They will speculate on which proposals may be more implementable in the near and long term, and which will be most impactful in helping to make space settlements a reality.

5:30 PM

Closing Remarks and Adjourn