

**Policy Recommendations for the United States
Government on Supporting the Development and
Operation of Commercial Space Stations**

Report prepared for the U.S. Department of State
Office of Outer Space Affairs (OES/SA)

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**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

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**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

Introduction.....	3
Recommendations.....	4
1. Governmental Support and Promotion for CLD Efforts.....	4
2. Establishing, Reforming, and Streamlining Government Regulations.....	5
3. Encouraging Business Development and Additional Revenue Streams.....	6
4. Bolstering International Cooperation and Business Dealings Abroad.....	6
Conclusion.....	7
Rationale for Recommendations.....	9
1. Governmental Support and Promotion for CLD Efforts.....	9
1.1 Establish a consortium under NASA.....	9
1.2 Develop a LEO National Lab under the proposed consortium.....	9
1.3 White House mandate for statements on CLDs.....	10
1.4 Issue a biannual report on CLDs and their international cooperation.....	11
2. Establishing, Reforming, and Streamlining Government Regulations.....	11
2.1. Reform International Traffic in Arms Regulations (ITAR).....	11
2.2 Work with Congress to designate space authority to the Departments of Commerce and Transportation.....	12
3. Encouraging Business Development and Additional Revenue Streams.....	13
3.1 Raise indemnification caps and expand them to include CLDs.....	13
3.2 Expand launch capabilities and negotiate interstate recognition of FAA launch licenses.....	13
4. Bolstering International Cooperation and Business Dealings Abroad.....	16
4.1 Negotiate an Intergovernmental Agreement (IGA) framework.....	16
4.2 Negotiate Technology Safeguard Agreements.....	17
4.3 Develop a public diplomacy office for space in the DoS.....	17
4.4 Encourage the space industry in emerging countries.....	18
Research Summary on Key Stakeholders.....	20
United States.....	20
International Partners.....	20
Australia.....	20
Canada.....	21
France.....	21
Germany.....	21
India.....	22
Italy.....	22
ESA.....	23

**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

EU.....	23
United Kingdom.....	24
Japan.....	24
Strategic Competitors.....	26
China.....	26
Russia.....	26
CLD Companies.....	26
Axiom Space.....	26
Blue Origin.....	27
NanoRacks (Voyager Space).....	27
VAST.....	27
Research Summary on Existing and Potential Frameworks.....	28
UN Frameworks.....	28
Outer Space Treaty (1967).....	28
UNOOSA working groups.....	28
U.S. Frameworks.....	28
Commercial Space Launch Competitiveness Act (2015).....	28
Commercial LEO Destinations.....	28
National Frameworks.....	29
Research Institutes.....	29
Research Summary on Operational Considerations.....	30
Export Controls.....	30
China Export Issues.....	30
Russia Export Issues.....	30
Russia’s Relationship with India.....	31
Launch Sites.....	31
List of Interviews.....	32

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

Introduction

We are entering a new era of space exploration, characterized by an increase in international collaboration, geopolitical competition, and commercial activity. As the countdown begins for the International Space Station (ISS) to be decommissioned around 2030, the United States finds itself at a critical juncture, driven by its need to sustain human presence in low Earth orbit (LEO) through alternative platforms. Having a presence in LEO enables the U.S. to conduct astronaut missions, scientific research, and the development of technologies for ambitious deep space projects such as the Artemis Program and the Lunar Gateway, which play an essential role in NASA's Moon to Mars strategy. To maintain a continued human presence in LEO during this post-ISS transition, NASA is providing funding to support the development and operation of Commercial Low Earth Orbit Destinations (CLDs), which will serve as new platforms for three main end-uses: human spaceflight, microgravity research, and space tourism. NASA's CLD program currently supports the development of three commercial space stations which are being led by the U.S.-based companies Voyager Space, Axiom Space, and Blue Origin.

This not only opens up promising avenues for collaboration across the commercial, government, and international spheres, but also underscores a growing momentum within the private space industry to pioneer the next frontiers of the space economy. Against this backdrop, space is also increasingly being characterized by geopolitical dynamics. As the United States endeavors to forge a new coalition of space nations through its leadership of the Artemis Accords, strategic adversaries such as China and Russia are also forming their own alliances. China's Tiangong space station demonstrates its efforts to establish a national presence in space, which is the only existing alternative to the ISS. Meanwhile, Russia's deployment of military capabilities in orbit signals a new paradigm in the weaponization of outer space. It is therefore strategically imperative that the United States maintains its leadership in and access to LEO through CLDs.

Establishing clear frameworks to support the development and govern the operation of CLDs will be an essential foundation to their success, allowing the United States Government (USG) to stimulate innovation and investment in the space economy, ensure safety, sustainability, and equitable access to space resources, and foster a secure and peaceful space environment. However, there are currently very few policies and regulations which address CLDs and related activities that contribute to the in-space economy.¹ This report for the U.S. State Department's Office of Space Affairs provides a set of specific recommendations for how the United States can most effectively support the development of CLDs to maintain its leadership in LEO, ensure a smooth transition from the ISS to CLDs, establish a sustainable business model for CLDs that prioritizes safety, innovation, and economic viability, and facilitate international collaboration amongst allies and partners while mitigating against potential threats to national security.

¹ Three examples of such frameworks include: NASA's Commercial LEO Destinations program; the National Space Policy (2020); the National Low Earth Orbit Research and Development Strategy (2023); and the U.S. Novel Space Activities Authorization and Supervision Framework (2023).

**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

Recommendations

1. Governmental Support and Promotion for CLD Efforts

In several interviews conducted during the research for this report, representatives from industry highlighted the importance of the USG making explicit the significance of CLDs to the overall U.S. national space strategy. The following recommendations aim to bolster public awareness of the role of the CLDs as well as highlight to potential investors that the United States is fully committed to the transition from the ISS to CLDs.

- 1.1 Establish a consortium under NASA.** NASA should establish a consortium on CLDs, including CLD developers, suppliers, and potential customers as well as being open to both domestic and international companies. The purpose of the consortium would be to provide a forum for discussion and collaboration on commercial LEO and CLD-related policy and regulation, funding programs, technology development, and commercial use. This would provide access to and transparency on the development of CLDs as a future economic platform in LEO to a wider range of stakeholders, including small and medium enterprises (SMEs) and startups, leading to greater investment, revenue streams, and opportunities for international collaboration.
- 1.2 Develop a LEO National Lab under the proposed consortium.** Inspired by the ISS National Lab, the USG should develop a LEO National Lab that would provide funding, R&D capabilities, and technical support for government-sponsored LEO research on both orbital and suborbital platforms, as well as terrestrial facilities related to human spaceflight and microgravity research. A key part of this would be a microgravity grant program that allows for non-traditional players to get involved in the CLD economy. As exemplified by NASA's In Space Production Applications (InSPA) program, which selects proposals for in-space manufacturing of materials and technologies, microgravity research has proven pivotal in advancing Earth-based applications. For instance, studies conducted on the ISS, such as those into protein crystallization, demonstrate significant potential for pharmaceutical advancements that could enhance drug safety and efficacy back on Earth. The United States can capitalize on this innovative momentum by offering microgravity research grants to a wider array of academic and private sector entities, thereby fostering a more diverse and robust ecosystem of space research. This recommendation aligns with the U.S. national interest by encouraging advancements in health, technology, and materials sciences – areas that have direct and beneficial applications for society.
- 1.3 White House mandate for statements on CLDs.** The White House National Space Council should mandate that relevant federal agencies publicly announce successes and milestones achieved by CLD companies that advance the transition from the ISS to CLDs. This could take the form of press releases, speeches at industry events, and social media highlights. This action would highlight the USG's commitment to the transition to CLDs and boost investor confidence in CLD companies.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

- 1.4 Issue a biannual report on CLDs and their international cooperation.** The State Department (DoS) should issue a biannual report detailing the current status of CLD international cooperation, emphasizing the achievements of American companies in cultivating fruitful and collaborative relationships with their international counterparts. Increased signaling from DoS; particularly, a regular, public acknowledgment of CLD efforts in nurturing relationships with international partners in concert with the interests and objectives of the U.S. government, would strengthen international interest in the program and enhance its legitimacy. This, in turn, would enable CLDs to foster further relationships with international partners.

2. Establishing, Reforming, and Streamlining Government Regulations

Citing concerns from industry, regulatory uncertainty undermines the ability of CLD companies to project confidence in the sustainability of their business models. The USG should take action to provide greater certainty regarding the regulatory landscape in the CLD industry.

- 2.1. Reform International Traffic in Arms Regulations (ITAR).** As noted by several interviewed in preparation for this report, ITAR remains a key obstacle limiting the CLD industry. ITAR limits the ability of CLD companies from engaging with the private sector of allies and partners to reduce costs, raise additional revenue, and utilize non-U.S. citizens. ITAR should include a tiered exemption system from licensing requirements for components and projects critical to CLDs. A possible model would comprise: near total exemptions for trusted allied nations (for instance, certain NATO members, Five Eyes, Japan, and South Korea), partial exemptions for key partner nations (such as Israel and India), and the continuation of full licensing requirements for non-allied and non-partner nations. These reforms should serve a parallel function to the Intergovernmental Agreement (IGA) for the ISS, which would provide increased capital and manufacturing capabilities as the USG seeks to ensure a sustained human presence in LEO.
- 2.2 Work with Congress to designate space authority to the Departments of Commerce and Transportation.** This report acknowledges the differing proposals between the White House and Congress regarding how authority over LEO should be divided. While both proposals have benefits, the USG should continue to allow the Department of Transportation to play a role in regulating LEO. Currently, the Federal Aviation Administration's (FAA) Office of Commercial Space Transportation is responsible for certifying spaceports and commercial launch and reentry. Given the short period of time left until the decommissioning of the ISS, the USG should ensure that it is properly able to regulate the LEO economy within the next 5-6 years. If and when the congressional proposal becomes law, the Department of Commerce's Office of Space Commerce should be provided the resources to regulate all activities in LEO. However, in the immediate future, the USG should support splitting the authority between Commerce and Transportation to ensure a smooth transition from the ISS to CLDs.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

3. Encouraging Business Development and Additional Revenue Streams

As NASA seeks to focus its efforts on the Moon, the development of Gateway, and beyond, the USG should take steps to ensure that CLD companies are able to achieve a sustainable business model. The following recommendations seek to address potential bottlenecks in the industry, as well as promote additional revenue streams.

3.1 Raise indemnification caps and expand them to include CLDs. With the risks involved with the development and launching of CLDs, the USG should raise the indemnification caps under the current Federal Aviation Administration (FAA) regulations and include space stations within this coverage. The present indemnification mechanism is insufficient when facing significant losses that may involve space stations. Our recommendation would ensure that the United States can provide adequate insurance coverage in the event of such losses, representing not just a sensible management of risk for American commercial space enterprises but also a clear signal to external investors of the proactive and responsible stance the USG is taking in managing space risks. Furthermore, this policy enhancement will significantly boost capital inflow, which is essential for propelling U.S. innovation and maintaining a lead in space technology. A higher indemnification cap will offer investors protection, reducing the uncertainties they face and thus attracting them to invest in high-risk space projects but with potentially high rewards. In addition, a reasonable indemnification mechanism will provide a clear operational framework for U.S. space enterprises and international partners, helping them to establish their stance in global competition, while ensuring that the U.S. maintains a strong position in important international space collaborations.

3.2 Expand launch capabilities and negotiate interstate recognition of FAA launch licenses. With increasing activity in LEO, there are concerns that limited launch capabilities in the United States would impact the LEO economy. In order to combat this, the USG should work with states to develop incentives to encourage the private sector to develop and improve existing launch infrastructure. These incentives could follow similar models used in the development of airports with tax exemptions and fees allowing for greater private investment. Furthermore, with the recent agreement with the government of New Zealand to allow the FAA launch certification to be valid in New Zealand, the DoS should negotiate the interstate recognition of FAA launch and reentry certifications in order to reduce regulatory hurdles for CLD companies that decide to use launch sites abroad. This would also ease congestion on launch sites in the homeland.

4. Bolstering International Cooperation and Business Dealings Abroad

The ISS was built in the spirit of international cooperation. While CLDs will be privately owned and operated, that same level of cooperation can be brought to CLDs as well. Through international cooperation, the USG can ensure allies and partners, both new and established in space, can participate in the LEO economy.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

- 4.1 Negotiate an Intergovernmental Agreement (IGA) framework.** The USG should develop a framework with allies and partner governments, inspired by the ISS IGA, which accommodates commercial interests and operations while maintaining the spirit of international cooperation and mutual respect. It should have a ‘cross-waiver liability’ section that prohibits any of the partners or their related entities from making claims against another partner or its related entities for damage that occurs as part of the commercial space activities. The cross-waiver of liability should be broadly construed to encourage participation in space exploration and utilization. It should cover all partners and related entities, including commercial entities, contractors, and users. The waiver should include damages arising from activities related to the operation or use of CLDs, with provisions for exceptions similar to those in the ISS IGA framework. This would allow for greater cooperation in the development, manufacturing, and launch of CLDs.
- 4.2 Negotiate Technology Safeguard Agreements.** In order to allow CLD companies to engage with foreign companies and governments to aid in the development and launch of CLDs, the DoS should negotiate technology safeguard agreements with allies and partners to allow American CLD companies to work efficiently with their counterparts. Most recently, the USG signed an agreement with Australia to allow for greater private sector cooperation in LEO while safeguarding U.S. rocket and satellite technology.
- 4.3 Develop a public diplomacy office for space in the DoS.** Frequently, both small and large players in the LEO economy have expressed the difficulty of contacting relevant regulatory offices in both the United States and abroad. The DoS should create a public diplomacy office for space in which the office would be tasked with working with the CLD industry as their point of contact and serving as a focal point connecting CLD companies with relevant regulatory agencies in foreign countries. This would allow both large and small CLD companies to reduce regulatory obstacles and improve ease of business.
- 4.4 Encourage the space industry in emerging countries.** While the USG works toward ensuring its allies and partners continue to have a presence in LEO, it is important for the USG to consider how to expand access to LEO for current and future emerging space powers. To that end, the DoS should expand part of the Fulbright program so that a segment of participants could focus on space science, technology, engineering, and legal frameworks to help these countries develop their domestic space sectors.

Conclusion

This report provides several recommendations for the USG to support the development, launch, and sustainability of commercial space stations. Overall, it is in the national interest to ensure that the United States and its allies and partners continue to maintain a sustained human presence in LEO. Through these recommendations, the USG can provide public support and investor confidence in CLD companies, the necessary regulatory certainty to build sustainable business models, improve ease of business both domestically and abroad, and bolster the necessary international cooperation to ensure a smooth transition from the ISS to CLDs.

**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

Rationale for Recommendations

1. Governmental Support and Promotion for CLD Efforts

1.1 Establish a Commercial LEO Consortium under NASA.

NASA should establish a Commercial LEO Consortium (CLC) to bring together stakeholders from the U.S. Government and the commercial LEO industry including CLD developers, suppliers, and potential customers, open to both domestic and international companies. The purpose of the CLC would be to provide a forum for discussion and collaboration on commercial LEO and CLD-related policy and regulation, funding programs, technology development, and commercial use. This would provide access to and transparency on the development of CLDs as a future economic platform in LEO to a wider range of stakeholders, including small and medium enterprises (SMEs) and startups, leading to greater investment, revenue streams, and opportunities for international collaboration.

This recommendation arose in part out of discussions we had with various companies at the SATELLITE conference as well as experts in the field.² It is also directly reflected in the White House OSTP's National LEO R&D Strategy, wherein the proposal for a LEO National Lab includes "establishing collaborative frameworks, such as institutes and consortia, which would be responsible for enabling engagement and collaboration across government, academia, industry, and international partners."³ There have been mixed opinions on this from stakeholders, with some expressing general support, while others are concerned about a government-sponsored approach to funding LEO research compared to more market-based alternatives such as a microgravity grants institution.⁴

1.2 Develop a LEO National Lab under the proposed consortium.

The proposed consortium described earlier should consider the establishment of a LEO National Laboratory following the model of the ISS National Lab, in close partnership with CLD stakeholders. The LEO National Lab's purpose would be to provide funding, R&D capabilities, and technical support for government-sponsored LEO research on both orbital and suborbital platforms, as well as terrestrial facilities related to human spaceflight and microgravity research. The consortium should ensure that the LEO National Lab has significant representation and support for the business needs of CLD

² In our Interview with Professor Scott Pace at George Washington University, we discussed arguments in favor of and against this recommendation.

³ White House, Office of Science and Technology Policy. "National Low Earth Orbit Research and Development Strategy." <https://www.whitehouse.gov/wp-content/uploads/2023/03/NATIONAL-LEO-RD-STRATEGY-033123.pdf>. March 2023.

⁴ Interview with Voyager Space and an off-the-record interview with a representative from a CLD company

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

companies, with access to funding being determined by a merit-based model. The LEO National Lab would also serve as a platform to promote the value of CLDs to investors and educate the public on the importance of space-based research.

It is recommended that microgravity research grants be extended beyond the traditional confines of NASA to harness the full potential of U.S. innovation in space. As exemplified by NASA's In Space Production Applications (InSPA) program.⁵ InSPA selects proposals for in-space manufacturing of materials and technologies and its microgravity research has proven pivotal in advancing Earth-based applications.⁶ For instance, studies conducted on the ISS, such as those into protein crystallization, demonstrate significant potential for pharmaceutical advancements that could enhance drug safety and efficacy back on Earth (NASA).⁷

The U.S. can capitalize on this innovative momentum by offering microgravity research grants to a wider array of academic and private sector entities, thereby fostering a more diverse and robust ecosystem of space research. Such a move would not only invigorate the scientific community with fresh perspectives and objectives but would also catalyze economic growth by attracting investment and nurturing a competitive marketplace. This recommendation aligns with the national interest by encouraging advancements in health, technology, and materials sciences – areas that have direct and beneficial applications for society. By bolstering the microgravity research framework and opening it to a broader spectrum of American ingenuity, the U.S. will reinforce its position as a global leader in space exploration and commercial space endeavors.

1.3 White House mandate for statements on CLDs.

The White House National Space Council should mandate that government officials, including those from NASA, the State Department, and the Department of Commerce should publicly announce successes and milestones achieved by CLD companies. This could take the form of press releases, speeches at industry events, and social media highlights. They should regularly release policy updates or initiatives that directly support the growth and development of the CLD sector. They should also organize investor briefings or roundtables that bring together government officials, CLD companies, and potential investors. These events can serve as platforms for discussing upcoming

⁵ "NASA. "In Space Production Applications - NASA." NASA, www.nasa.gov/international-space-station/space-station-research-and-technology/in-space-production-applications. 22 November 2023.

⁶ Guzman, Ana. "NASA Selects Proposals to Enable Manufacturing in Space for Earth - NASA." NASA. www.nasa.gov/missions/station/nasa-selects-proposals-to-enable-manufacturing-in-space-for-earth. 22 August 2023.

⁷ Gilder, Carrie. "Creating New and Better Drugs With Protein Crystal Growth Experiments - NASA." NASA, 12 Sept. 2023, www.nasa.gov/missions/station/iss-research/creating-new-and-better-drugs-with-protein-crystal-growth-experiments.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

projects, government incentives, and investment opportunities, fostering direct dialogue and engagement.

1.4 Issue a biannual report on CLDs and their international cooperation.

The State Department should issue a biannual report detailing the current status of CLD international cooperation, emphasizing the achievements of American companies in cultivating fruitful and collaborative relationships with their international counterparts. A representative from industry noted a lack of communication regarding the alignment of objectives between the U.S. government and CLDs.⁸

Increased signaling from the State Department; particularly, a regular, public acknowledgement of CLD efforts in nurturing relationships with international partners in concert with the interests and objectives of the U.S. government, would strengthen international interest in the program and enhance its legitimacy. This, in turn, would enable CLDs to foster further relationships with international partners.

2. Establishing, Reforming, and Streamlining Government Regulations

2.1. Reform International Traffic in Arms Regulations (ITAR).

The USG should reform the International Traffic in Arms Regulations (ITAR) to include a tiered exemption system from licensing requirements for components and projects critical to CLDs. ITAR is a United States regulatory regime, overseen by the Department of State, to restrict and control the export of technologies with defense and military-related applications.⁹ ITAR controls regarding space-related technologies were last reformed in the early 2010s.¹⁰ Since then, the development of the commercial space sector, which involves non-U.S. companies and employees has grown, while legislation has lagged behind in providing exemptions for non-U.S. citizens (even those from allied countries) to work on CLD projects.

This issue was raised independently by at least ten individuals we interviewed, who represent large and small companies alike, allied and partner nations, and eminent policy experts. Companies expressed frustrations over challenges in recruiting existing employees for projects related to CLDs who were non-U.S. citizens, yet from trusted allied countries.¹¹ Meanwhile, diplomatic representatives highlighted that ITAR

⁸ Personal interview with industry representative

⁹ Department of State, "Directorate of Defense Trade Controls," [state.gov, https://www.state.gov/bureaus-offices/under-secretary-for-arms-control-and-international-security-affairs/bureau-of-political-military-affairs/directorate-of-defense-trade-controls-pm-ddtc/](https://www.state.gov/bureaus-offices/under-secretary-for-arms-control-and-international-security-affairs/bureau-of-political-military-affairs/directorate-of-defense-trade-controls-pm-ddtc/).

¹⁰ Foust, Jeff. "U.S. government plans review of space technology export controls," [Spacenews.com, https://spacenews.com/u-s-government-plans-review-of-space-technology-export-controls/](https://spacenews.com/u-s-government-plans-review-of-space-technology-export-controls/). April 2024.

¹¹ Personal interviews with representatives from CLD companies, small companies involved in the LEO ecosystem, and policy experts.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

restrictions hindered the capacity of their domestic companies, which could make substantial contributions to CLD projects in the United States, from doing so.¹²

As a result, we propose a model for ITAR reform that would comprise: near total exemptions for trusted allied nations (for instance, NATO members, Five Eyes, Japan, and South Korea), partial exemptions for key partner nations (such as Israel), and the continuation of full licensing requirements for non-allied and non-partner nations.

2.2 Work with Congress to designate space authority to the Departments of Commerce and Transportation.

The White House, through the National Space Council, has proposed a bill that would split new space authorities between the Transportation and Commerce Departments.¹³ The DoT, or more precisely, the FAA's Office of Commercial Space Transportation, would be in charge of keeping people safe in orbit, aboard commercial space stations, and on or around the moon or another planet. It would also have the authority to regulate in-space transportation of goods, like fuel, from one point to another in space. The Commerce Department would then be responsible for overseeing uncrewed novel space activities, such as space debris removal missions and in-space manufacturing.¹⁴

The U.S. Congress's bill proposal so far would designate the Commerce Department's Office of Space Commerce as the "single authority" for authorizing and supervising novel space missions outside of the spectrum, which the Federal Communications Commission (FCC) would handle, and launch, which the FAA would oversee.¹⁵ At the time of its introduction (before the WH was able to put out its legislative proposal), major players like Blue Origin, Sierra Space, and SpaceX all supported the Commercial Space Act of 2023. Even so, there is currently no bipartisan co-sponsorship of this bill as it is only backed by a total of 9 Republican House members.

Currently, it is unclear which proposal major and smaller players support. Even so, we believe that our recommendation should align with the National Space Council's legislative proposal. The White House proposal of giving mission authorization and the responsibility of creating a new regulatory framework and licensing process for new space activities to both the DoT and DoC would take advantage of both Department's regulatory expertise and competencies.

¹² Personal interviews with representatives from four different national governments.

¹³ Swope, Clayton. "Mission Authorization: Decoding the Space Policy Dilemma." *Center for Strategic & International Studies*. <https://www.csis.org/analysis/mission-authorization-decoding-space-policy-dilemma>. December 2023.

¹⁴ White House, National Space Council. "Novel Space Activities Legislative Text." *WhiteHouse.gov*. <https://www.whitehouse.gov/spacecouncil/>. November 2023.

¹⁵ "Text - H.R.6131 - 118th Congress (2023-2024): Commercial Space Act of 2023." *Congress.gov*, Library of Congress, <https://www.congress.gov/bill/118th-congress/house-bill/6131/text>. 29 November 2023.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

3. Encouraging Business Development and Additional Revenue Streams

3.1 Raise indemnification caps and expand them to include CLDs.

To ensure the United States maintains its leadership in the commercial space sector, it is recommended to raise the indemnification caps under the current Federal Aviation Administration (FAA) regulations.¹⁶ The USG should also include space stations within this coverage.¹⁷ With the risks and potential value of space activities escalating, adjusting the indemnification limits is a critical strategic measure to ensure parity with international competitors. The present indemnification mechanism is insufficient when facing significant losses that may involve space stations. Our recommendation would ensure that the United States can provide adequate insurance coverage in the event of such losses, representing not just robust risk management for American commercial space enterprises, but also a clear signal to external investors of the proactive and responsible stance the U.S. government is taking in managing space risks.

Furthermore, this policy enhancement will significantly boost capital inflow, which is essential for propelling U.S. innovation and maintaining a lead in space technology. A higher indemnification cap will offer investors protection, reducing the uncertainties they face and thus attracting them to invest in high-risk space projects but with potentially high rewards. In addition, a reasonable indemnification mechanism will provide a clear operational framework for U.S. space enterprises and international partners, helping them to establish their stance in global competition, while ensuring that the U.S. maintains a strong position in important international space collaborations. In summary, raising the indemnification caps is a practical and pragmatic step in U.S. space policy, crucial for safeguarding national interests and promoting the sustainable development of the commercial space industry.

3.2 Expand launch capabilities and negotiate interstate recognition of FAA launch licenses.

The urgent need for the development of commercial spaceports is a pressing issue. Several government programs help fund the development of spaceport infrastructure, “including the Airport Improvement Program, the Space Transportation Infrastructure Matching Grants Program, the Department of Transportation Discretionary Grants Programs, and a potential Joint DoD/FAA Infrastructure Program.”¹⁸ However, these

¹⁶ Federal Aviation Administration. “FAA Regulations.” www.faa.gov/regulations_policies/faa_regulations. 20 September 2023.

¹⁷ Personal interview with industry representative.

¹⁸ Global SpacePort Alliance. “National Spaceport Network Development Plan”, https://www.faa.gov/about/office_org/headquarters_offices/ast/advisory_committee/meeting_news/media/2020/june/National_Spaceport_Network_Development_Plan.pdf, June 2020.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

programs lack the incentives for states or investors to develop, expand, or upgrade spaceports.¹⁹

The National Spaceport Intergovernmental Working Group (NSIWG), led by the FAA, is a federal government working group to develop a National Spaceport Strategy which is aimed to address the need to promote innovation and investment in spaceport infrastructure. In addition to this, in 2023, several bills were introduced to address access to spaceport launch issues, like the Alleviating Spaceport Traffic by Rewarding Operators (ASTRO) Act and the Spaceport Act, which address funding complexities.²⁰

We recommend the establishment of a pilot program that reaches a broader investor community and supports spaceport investors at different stages of development to ensure successful implementation. To this end, we recommend providing states with airport infrastructure development incentives such as tax exemptions and considering general aviation airport models like landing and hangar fees.²¹ This will assist in the development of several much-needed spaceport infrastructures to expand and prevent bottlenecks, in addition to collaborating with the NSIWG to promote a clear strategy on how the State Department can support the FAA in promoting transportation infrastructure development.

Spaceport “bottlenecking” and congestion will become more pervasive as commercial space activities increase in the future. Two factors intervene with timely launching: licensing and launch site capabilities. Popular U.S. spaceports like Cape Canaveral are overcrowded, while others have issues regarding equipment and launch capacity capabilities. These issues will constrain launch opportunities, preventing companies from launching their equipment.²²

Reducing congestion will require necessary infrastructure, and the utilization of spaceports abroad may be desirable. However, companies are reluctant to utilize spaceports abroad due to licensing complexities and issues. Therefore, fostering relationships with international governments and partners to limit licensing duplications

¹⁹ Interview with the FAA, Office of Spaceports

²⁰ Warner, Mark. “Warner and Sullivan Introduce Bipartisan Bill to Turbo Charge Investment in American Spaceports”, Astro Act, <https://www.warner.senate.gov/public/index.cfm/2023/11/warner-and-sullivan-introduce-bipartisan-bill-to-turbocharge-investment-in-american-spaceports>. November 2023 and Hickenlooper, Hickenlooper, “Cornyn, Luján, Wicker Introduce Bill to Launch New Era of Spaceports” Spaceport Act, https://www.hickenlooper.senate.gov/press_releases/hickenlooper-cornyn-lujan-wicker-introduce-bill-to-launch-new-era-of-spaceports/. June 2023.

²¹ Global Spaceport Alliance. *National Spaceport Network Development Plan*. https://www.faa.gov/about/office_org/headquarters_offices/ast/advisory_committee/meeting_news/media/2020/june/National_Spaceport_Network_Development_Plan.pdf. 1 June 2020.

²² Interview with the FAA, Office of Spaceports

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

would be ideal for making these launch locations more desirable to companies and would open up more opportunities to support the commercial space industry.

FAA has been granted the authority under 51 USC Ch. 509: Commercial Space Launch Activities, Title 51 – National and Commercial Space Programs, to license international launch or reentry activities, and by FAA regulation, “any U.S. commercial space launch or reentry operator launching or reentering outside the United States is required to be licensed by the FAA. In addition, any non-U.S. commercial space launch and reentry vehicles operating in the United States must be licensed by the FAA.”²³

Under §50904, Restrictions on launches, operations, and reentries²⁴

(a) Requirement. – A license issued or transferred under this chapter, or a permit, is required for the following:

(4) for a citizen of the United States (as defined in section 50902(1)(C) of this title) to launch a launch vehicle or to operate a launch site or reentry site, or to reenter a reentry vehicle, in the territory of a foreign country if there is an agreement between the United States Government and the government of the foreign country providing that the United States Government has jurisdiction over the launch or operation or reentry.

The FAA has signed a Memorandum of Cooperation with New Zealand, titled the “Memorandum of Cooperation on International Commercial Space Transportation between the United States Federal Aviation Administration and the New Zealand Ministry of Business, Innovation and Employment”.²⁵ Through this memorandum, “New Zealand’s licensing regime enables the Minister to treat the fact that an applicant for a license to conduct space launches in New Zealand holds a license from the FAA as satisfying some or all of the criteria for a New Zealand license.”²⁶ This means that only one license is required for launching from New Zealand.

²³ Federal Aviation Administration. “International Affairs.” https://www.faa.gov/space/additional_information/international_affairs. April 2024.

²⁴ United States of House of Representative. “CHAPTER 509—COMMERCIAL SPACE LAUNCH ACTIVITIES.” CHAPTER 509—COMMERCIAL SPACE LAUNCH ACTIVITIES. <https://uscode.house.gov/view.xhtml?path=/prelim@title51/subtitle5/chapter509&edition=prelim>. April 2024.

²⁵ Memorandum of Cooperation on International Commercial Space Transportation Between the United States Federal Aviation Administration and the New Zealand Ministry of Business, Innovation, and Employment, https://www.faa.gov/sites/faa.gov/files/space/additional_information/international_affairs/FAA_MBIE_MOC.pdf. April 2024.

²⁶ Memorandum of Cooperation on International Commercial Space Transportation Between the United States Federal Aviation Administration and the New Zealand Ministry of Business, Innovation, and Employment, https://www.faa.gov/sites/faa.gov/files/space/additional_information/international_affairs/FAA_MBIE_MOC.pdf. April 2024.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

Through the U.S.-New Zealand partnership, RocketLab built a private orbital range launch site, allowing RocketLab to streamline launch operations and reduce congestion at other popular spaceports. According to RocketLab, “Rocket Lab offers the world’s only private orbital launch range in Mahia, New Zealand... An FAA-licensed spaceport, Launch Complex 1 can provide up to 120 launch opportunities every year. Operating a private orbital launch site alongside its own range and mission control centers allows Rocket Lab to reduce the overhead costs per mission, resulting in a cost-effective launch service for satellite operators.”²⁷

Other countries that have signed agreements with the FAA include the UK, Brazil, Germany, UAE, Italy, and France. Leveraging and promoting these agreements will be crucial to streamlining licensing processing by reducing duplication and making international spaceports open to organizations. By extending similar agreements to Portugal, Spain, Sweden, Norway, Canada, France, Japan, India, South Korea, and Australia can provide a greater contribution to reducing licensing duplications and reducing time and money spent on licensing in the commercial space industry.

4. Bolstering International Cooperation and Business Dealings Abroad

4.1 Negotiate an Intergovernmental Agreement (IGA) framework.

The State Department should negotiate an ISS-inspired Intergovernmental Agreement (IGA) like framework for CLDs. This framework should accommodate commercial interests and operations while maintaining the spirit of international cooperation and mutual respect. It should have a “cross-waiver liability” section that prohibits any of the partners or their related entities from making claims against another partner or its related entities for damage that occurs as part of the commercial space activities.

The cross-waiver of liability should be broadly construed, similar to the ISS IGA, to encourage participation in space exploration and utilization. It should cover all partners and related entities, including commercial entities, contractors, and users. The waiver should include damages arising from activities related to the operation or use of CLDs, with provisions for exceptions similar to those in the ISS IGA framework.

For reference, the IGA which involves the United States, Canada, Japan, the Russian Federation, and member states of the European Space Agency, includes specific provisions regarding liability and legal actions among the participating entities.²⁸ A key aspect of this agreement is the establishment of a “cross-waiver of liability” under Article

²⁷ RocketLab. “Launch With Us.” RocketLab website, <https://www.rocketlabusa.com/launch/launch-with-us/>. April 2024.

²⁸ U.S. Department of State. “Multilateral - Space - Space Station.” <https://www.state.gov/wp-content/uploads/2019/02/12927-Multilateral-Space-Space-Station-1.29.1998.pdf>. January 1998.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

16.²⁹ This prohibits any of the partners or their related entities (including contractors, sub-contractors, users, and customers) from making claims against another partner or its related entities for damage that occurs as part of ISS activities.³⁰

4.2 Negotiate Technology Safeguard Agreements.

The State Department should negotiate Technology Safeguard Agreements with allies and partners. A Technology Safeguards Agreement (TSA) is an agreement that focuses on protecting technology and intellectual property during sharing or transfer processes. While negotiating TSAs is a long and difficult process, the United States has had success in the past. For example, a satellite TSA between Kazakhstan, Russia, and the U.S was signed on January 25, 1999, promising to protect the technology used to launch American satellites from the Baikonur Cosmodrome in Russia.³¹ In October 2023, the U.S and Austria signed the TSA which allows US companies to carry out space launch activities in Australia at the same time protecting the US technology, including rockets and satellites.³² The USG should seek a similar agreement with Japan for instance. Some private entities mentioned TSA would strengthen international cooperation with allies, because TSA could facilitate new commercial opportunities for the aerospace industry benefiting the economies of both countries.³³

4.3 Develop a public diplomacy office for space in the DoS.

The Department of State should develop a public diplomacy for space to serve as a point of contact between CLD and other LEO economy companies and the relevant regulatory bodies abroad. This recommendation was developed over the course of several interviews with industry representatives, especially smaller companies. Companies spoke of the need to have a clear point of contact in the State Department who could also connect industry with relevant regulatory bodies abroad. This office would improve ease of business for CLD companies and ensure that smaller companies in the LEO economy can have access to international partners.

Furthermore, a specialized public diplomacy office for space in the DoS could also be responsible and lead the effort on joint declarations, partnerships, and frameworks. A clear example of this would be the recent Atlantic Declaration: A Framework for a

²⁹ U.S. Department of State. "Multilateral - Space - Space Station." <https://www.state.gov/wp-content/uploads/2019/02/12927-Multilateral-Space-Space-Station-1.29.1998.pdf>. January 1998.

³⁰ U.S. Department of State. "Multilateral - Space - Space Station." <https://www.state.gov/wp-content/uploads/2019/02/12927-Multilateral-Space-Space-Station-1.29.1998.pdf>. January 1998.

³¹ U.S. Department of State. "Fact Sheet: Satellite Technology Safeguards Agreement." www.state.gov/travels/1999/990125satlite_tech.html. 20 January 2001.

³² U.S. Department of State. "U.S.-Australia Technology Safeguards Agreement (TSA)." www.state.gov/u-s-australia-technology-safeguards-agreement-tsa. 26 October 2023.

³³ Personal interview with industry representative

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

Twenty-First Century U.S. - UK Economic Partnership.³⁴ Through interviews with the British Embassy and Consulates, they have indicated the benefits in having the leadership and agencies of two partner countries coming together to outline a joint framework on current and future partnerships.³⁵ This not only gives direction for the two country's agencies and what interests can be prioritized, but it also facilitates the working relationship between the two partnering countries into efficient outcomes.

4.4 Encourage the space industry in emerging countries.

As the ISS approaches its decommissioning around 2030, ensuring that emerging space nations and underrepresented countries are not left behind in the transition to Commercial Low Earth Orbit Destinations is crucial for maintaining international cooperation and inclusivity in space exploration. This should be a priority for the U.S. Department of State, to work alongside CLD companies and international partners and organizations to foster a more inclusive environment in LEO and beyond.

The Artemis Accords campaign by NASA and the U.S. Department of State has prioritized the landing of the first woman, the first person of color, and the first international partner astronaut on the moon to make new scientific discoveries and explore more of the lunar surface than ever before for the benefit of all mankind.³⁶ We believe that as the United States and NASA lead the effort into space, we are best positioned to help and bring together emerging space nations and underrepresented countries to ensure they are not left behind in the transition to Commercial Low Earth Orbit Destinations. The Artemis Accords can function as a roadmap into how to make an intergovernmental framework for cooperation in LEO.

The State Department should implement changes to the Fulbright program to ensure that students from emerging space powers can have the opportunity to study in the United States and later return to their home countries to develop their own domestic space economies.³⁷

Furthermore, we recommend that the Department of State:

1. Launch Capacity-Building Programs: Initiate or support capacity-building and educational programs aimed at emerging space nations. These can come in the form of scholarships or sponsoring scientists and researchers from partner emerging nations. Examples of this are the Fulbright Program conducted by the

³⁴ White House. "The Atlantic Declaration: A Framework for a Twenty-First Century U.S. - UK Economic Partnership." June 08, 2023. <https://www.whitehouse.gov/briefing-room/statements-releases/2023/06/08/the-atlantic-declaration-a-framework-for-a-twenty-first-century-u-s-uk-economic-partnership/>

³⁵ Interview with the British Consulate.

³⁶ National Aeronautics and Space Administration. "The Artemis Accords." NASA. <https://www.nasa.gov/artemis-accords/>. October 2020.

³⁷ Interview with the British Consulate, Los Angeles.

**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

- DoS. These programs could focus on space science, technology, engineering, and legal frameworks to help countries develop their domestic space sectors.
2. Facilitate Access to CLDs: The DoS can work alongside CLD companies and international partners to facilitate agreements or programs that provide emerging space nations and underrepresented countries with affordable access to CLDs. This could range from sponsoring and/or allocating spots for underrepresented nations to send up their astronauts into the CLDs, giving affordable access to scientific research and technological testing spaces, and so on.
 3. Promote International Cooperation: The DoS can lead the effort alongside partners and underrepresented countries that structure international agreements to encourage collaboration and representation on CLDs. This could include provisions that ensure participation by underrepresented countries. To do this, the DoS can work to ensure that emerging space nations have active involvement in international forums and organizations, such as the UN Committee on the Peaceful Uses of Outer Space.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

Research Summary on Key Stakeholders

United States

The United States prioritizes maintaining its leadership in space exploration, security, commercial space economy growth, sustainability, and the ambitious Artemis program, aimed at returning humans to the Moon and establishing a sustainable presence.³⁸ This strategy is underlined by fostering innovation, STEM education, and international collaboration. It aims to transition from the ISS to Commercial Low Earth Orbit Destinations (CLDs) to ensure a robust space economy and human presence in LEO. Through Space Act agreements, the U.S. collaborates with companies like Axiom Space, Blue Origin, and Nanoracks, supporting the development of commercial space stations and technologies critical for Artemis and lunar exploration, all within a comprehensive legal framework that promotes safe and sustainable space activities.³⁹

International Partners

Australia

Australia's space strategy prioritizes innovation in technology, navigation, earth observation, and communication, with a focus on infrastructure and security. It leverages its geographic position for global space governance and collaboration, particularly through the Quad alliance.⁴⁰ The nation's capabilities in LEO and CLDs are highlighted by initiatives like the Trailblazer program for lunar exploration and partnerships with companies for satellite communication and space sector growth, supported by frameworks such as the Space (Launches and Returns) Act 2018.⁴¹ Internationally, Australia collaborates with partners like NASA and ESA, adhering to UN space treaties to promote peaceful and sustainable space exploration.

³⁸ New Space Economy. "US National Space Priorities – a Quick Overview." [newspaceeconomy.ca/2023/01/07/us-national-space-priorities-a-quick-overview](https://www.newspaceeconomy.ca/2023/01/07/us-national-space-priorities-a-quick-overview). 29 May 2023.

³⁹ Lloyd, Andrea. "NASA Adjusts Agreements to Benefit Commercial Station Development - NASA." NASA, www.nasa.gov/humans-in-space/commercial-space/leo-economy/nasa-adjusts-agreements-to-benefit-commercial-station-development. 11 March 2024.

⁴⁰ Australian Academy of Science. "Australia in Space: A Decadal Plan for Australian Space Science." <https://www.science.org.au/supporting-science/science-policy-and-analysis/decadal-plans-science/australiainspace>. January 2022.

⁴¹ Government of Australia. "Moon to Mars Initiative: Trailblazer Stage 1." [business.gov.au, business.gov.au/grants-and-programs/moon-to-mars-trailblazer](https://www.business.gov.au/grants-and-programs/moon-to-mars-trailblazer) 27 February 2024; Government of Australia. "Launches and Returns Act 2018." www.legislation.gov.au/C2004A00391/latest/text.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

Canada

Canada is advancing its space ambitions through contributions to lunar exploration, notably the Canadarm3 for the Gateway station, and enhancing low Earth orbit capabilities for security and communication, especially in the Arctic.⁴² It collaborates internationally, particularly with NASA and the European Space Agency, and engages with domestic CLD companies through regulatory support and strategic partnerships, all while aiming to inspire the next generation in STEM and ensure global innovation leadership.⁴³

France

Through its “New Space” initiative, which was established in 2018, France seeks to cultivate private-public relationships on space-related projects, including telecommunications satellites and Mars missions.⁴⁴ Overall, France sees the dawn of “new space” and space commercialization in somewhat negative terms: as a disruptor to the traditional space ecosystem and France’s status in space development.⁴⁵ In response, France seeks to support domestic companies and work with international partners: particularly Germany and Italy and (less enthusiastically) the United States and United Kingdom. Nevertheless, engagement between French and American companies is growing. In 2023, a delegation from the French Space Agency CNES visited Colorado and Texas to grow ties between French and American aerospace companies.⁴⁶

Germany

Germany's new space strategy was released in Sept 2023 outlining initiatives to become more competitive with other international space agencies and companies. Germany is intending to meet growing demand in the small commercial satellites market. Germany is hoping to shore up its position by opening the spaceport on the North Sea. In the future, the North Sea platform will

⁴² Canadian Space Agency. “About Canadarm3.” Canadian Space Agency, www.asc-csa.gc.ca/eng/canadarm3/about.asp. 12 March 2024.

⁴³ Canadian Space Agency. “Grants for Space STEM Initiatives for Youth.” Canadian Space Agency, www.asc-csa.gc.ca/eng/funding-programs/funding-opportunities/ao/2021-grants-space-stem-youth.asp. 13 August 2021.

⁴⁴ Armed Forces Ministry. “Space Defence Strategy,” defense.gouv.fr, https://cd-geneve.delegfrance.org/IMG/pdf/space_defence_strategy_2019_france.pdf?2194/80ea1f07a5171e4ee796a52752c9bce695d34acb. November 2019.

⁴⁵ Ibid. and “The French New Space is playing in the big league,” lafrench-fab.com, <https://lafrench-fab.com/news/the-french-new-space-is-playing-in-the-big-league/#:~:text=Originally%2C%20Exotrail%20manufactured%20miniaturized%20electric,for%20moving%20around%20in%20orbit>. February 2023.

⁴⁶ “France to establish NewSpace hubs in Denver and Houston,” spacewatch.com, <https://spacewatch.global/2023/12/france-to-establish-newspace-hubs-in-denver-and-houston/>. December 2022.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

be used for European microlaunchers – rockets loaded with small satellites – capable of carrying up to one ton into low-Earth orbits.”⁴⁷

India

The government of India has expressed an interest in engaging with and facilitating the development of the private sector to advance its interests in space, which increasingly revolve around space exploration and using space for national security purposes.⁴⁸ India has some domestic commercial space companies, which are fairly new but very active and ambitious.⁴⁹ India does not have a comprehensive framework on CLDs, and the only government source to mention the topic (albeit vaguely) is its Space Policy 2023. However, that NanoRacks and India Space Research Organization signed a contract for a small satellite rideshare on ISRO’s Polar Satellite Launch Vehicle in 2018 (the company’s first customer contract), and ISRO has signed an MoU with Voyager Space in 2023 and is currently in “deep talks” with Blue Origin, signals India’s close interest and willingness to engage directly with CLDs.⁵⁰

Italy

Italy has several current or near future space missions.⁵¹ Italy hopes to partner with NASA on future missions and has doubled its investment in the space domain in the past year.⁵² Italy has also pulled out of the Belt and Road initiative.⁵³

⁴⁷ Freund, Alexander. “Taking on SpaceX: Why Germany Is Building Its Own Spaceport.” Deutsche Welle (DW), <https://www.dw.com/en/taking-on-spacex-why-germany-is-building-its-own-spaceport-w2/a-6716669>. 23 October 2023.

⁴⁸ Indian Space Research Organisation. “Indian Space Policy 2023,” [isro.gov, https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf](https://www.isro.gov.in/media_isro/pdf/IndianSpacePolicy2023.pdf). 2023.

⁴⁹ For instance, “Skyroot Aerospace,” <https://skyroot.in/> and “Pixxel,” <https://www.pixxel.space/>.

⁵⁰ Bloomberg, “India in talks with Boeing, Blue Origin for space partnerships.” November 2023, <https://www.livemint.com/science/news/india-in-talks-with-boeing-blue-origin-for-space-partnerships-11701263899573.html>; “Voyager Space Signs MoU with ISRO and IN-SPACE to Explore Utilization of Gaganyaan Spacecraft for the Starlab Space Station,” [prnewswire.com](https://www.prnewswire.com), July 2023, <https://www.prnewswire.com/news-releases/voyager-space-signs-mou-with-isro-and-in-space-to-explore-utilization-of-gaganyaan-spacecraft-for-the-starlab-space-station-301872553.html>, Nyirady, Annamarie, “NanoRacks Signs 1st Customer Contract for India’s PSLV Launch,” [satellitetoday.com](https://www.satellitetoday.com), December 2018, <https://www.satellitetoday.com/launch/2018/12/19/nanoracks-signs-1st-customer-contract-for-indias-pslv-launch/>.

⁵¹ Agenzia Spaziale Italiana. “SPACE TRANSPORTATION - ASI.” ASI, <https://www.asi.it/en/space-transportation/>. 10 April 2020.

⁵² Brunswick, Shelli. “From Galileo to the Lunar Gateway: Mapping Italy’s Growing Space Industry.” *SpaceNews*, <https://spacenews.com/from-galileo-to-the-lunar-gateway-mapping-italys-growing-space-industry/>. 19 April 2023; Feldscher, Jacqueline. “Italy Seeks More Cooperation With US Industry on Space.” *Payload*, <http://payloadspace.com/italy-seeks-more-cooperation-with-us-industry-on-space/>. 31 October 2023.

⁵³ Mazzocco, Ilaria, and Andrea Leonard Palazzi. “Italy Withdraws from China’s Belt and Road Initiative.” *CSIS*, <http://www.csis.org/analysis/italy-withdraws-chinas-belt-and-road-initiative>. 14 December 2023.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

European Space Agency

The European Space Agency (ESA) is especially focused on providing benefits from space to European citizens.⁵⁴ ESA's interest in space stations include international cooperation on the ISS, training for astronauts, scientific experiments on the ISS, and the development of the Deep Space Gateway.⁵⁵ ESA views the ISS and post-ISS CLDs as a training ground for further exploration to the Moon and Mars. For satellites, ESA cooperates closely with the European Commission and the EU Agency for the Space Programme (EUSPA).⁵⁶ ESA's member states have space infrastructure companies including Airbus (France), Thales Alenia (France/Italy), and Space Solar (United Kingdom). Airbus has recently established a partnership with ESA and Voyager Space to collaborate on the development and operation of the Starlab space station.⁵⁷ ESA has made statements that highlight the importance of maintaining European access to space and international cooperation during the post-ISS transition to CLDs. It has welcomed the opportunity for a transatlantic partnership between ESA, Airbus, and Voyager Space.⁵⁸

European Union

The European Union (EU) is especially focused on providing benefits from space to European citizens and maintaining European autonomy for access to and operations in space.⁵⁹ The EU's interests in space stations include international prestige and European autonomy. The EU views the ISS as a platform to display its global leadership and it highly prioritizes maintaining cooperation with the United States and other like-minded nations.⁶⁰ The EU's activities in space are more focused on satellites and downstream applications than space infrastructure such as

⁵⁴ European Space Agency. "ESA Vision," esa.int, <https://vision.esa.int/>. March 2024.

⁵⁵ European Space Agency, SciSpace. "International Space Station (ISS)," esa.int, <https://scispace.esa.int/scispace-platforms/international-space-station/>. March 2024; European Space Agency. "International Space Station legal framework," esa.int, https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/International_Space_Station/International_Space_Station_legal_framework. March 2024; European Space Agency. "What is the Deep Space Gateway?," esa.int, <https://exploration.esa.int/web/moon/-/59374-overview>. September 2019.

⁵⁶ European Space Agency. "Introducing Copernicus," esa.int, https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Preparing_for_European_commercial_presence_in_low_Earth_orbit. September 2019.

⁵⁷ European Space Agency. "Preparing for European commercial presence in low Earth orbit," esa.int, https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Preparing_for_European_commercial_presence_in_low_Earth_orbit. November 2023.

⁵⁸ Airbus. "Starlab Space Station to boost European Space Agency ambitions in low-Earth orbit," airbus.com, <https://www.airbus.com/en/newsroom/press-releases/2023-11-starlab-space-station-to-boost-european-space-agency-ambitions-in>. November 2023.

⁵⁹ European Space Agency. "Joint statement on shared vision and goals for the future of Europe in space by the EU and ESA". https://www.esa.int/About_Us/Corporate_news/Joint_statement_on_shared_vision_and_goals_for_the_future_of_Europe_in_space_by_the_EU_and_ESA. October 2016.

⁶⁰ European Commission. "EU Space Strategy for Security and Defence," https://defence-industry-space.ec.europa.eu/eu-space/eu-space-strategy-security-and-defence_en. March 2023.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

commercial space stations. Europe's upstream activities generally fall under the mandate of ESA, with strategic direction and funding from the EU (such as supporting Airbus).⁶¹

United Kingdom

While the UK seeks to be a leading power in establishing a regulatory framework for commercial space activities, it plans for its engagement in LEO to be largely limited to satellites.⁶² The UK has established regulatory frameworks for the commercial space programs that are carried out from spaceports in the United Kingdom and launches and other activities overseas by UK entities.⁶³ There is no reference to CLDs, per se, but UK legislation may provide blueprints for broader, overarching frameworks on CLDs. The UK seeks to build a commercial spaceport on British territory, which would improve its orbital launch capabilities.⁶⁴

Japan

Ensuring space security, utilizing technology and scientific knowledge, and ensuring economic opportunities are key priorities of Japanese space policy.⁶⁵ The importance of the security aspect has been heightened, leading to the establishment of a Space Security Initiative in 2023.⁶⁶ Regarding the aspect of space commercialization, Japan recognizes the challenge of its relatively small market size and aims to double the domestic space-related market from 4 trillion

⁶¹ European Union Agency for the Space Programme. "About EUSPA".
<https://www.euspa.europa.eu/about/about-euspa>. January 2024.

⁶² UK Government, "National Space Strategy," gov.uk,
<https://www.gov.uk/government/publications/national-space-strategy/national-space-strategy#executive-summary>. February 2022; UK Government, "Unlocking Space for Business," gov.uk,
<https://www.gov.uk/government/publications/unlocking-space-for-business>. October 2023; UK Government, "Referral of the Connectivity in Low Earth Orbit Programme by the UK Space Agency," gov.uk,
[https://www.gov.uk/cma-cases/referral-of-the-connectivity-in-low-earth-orbit-programme-by-the-uk-space-agency-uksa#:~:text=The%20Connectivity%20in%20Low%20Earth%20Orbit%20\(C%2DLEO\)%20scheme,global%20market%20for%20these%20technologies](https://www.gov.uk/cma-cases/referral-of-the-connectivity-in-low-earth-orbit-programme-by-the-uk-space-agency-uksa#:~:text=The%20Connectivity%20in%20Low%20Earth%20Orbit%20(C%2DLEO)%20scheme,global%20market%20for%20these%20technologies). December 2023.

⁶³ UK Government. "Space Industry Act," gov.uk,
https://aerospace.org/sites/default/files/policy_archives/UK%20Space%20Industry%20Act%2015Mar18.pdf. 2018; UK Government, "Guidance on liabilities under the Space Industry Act 2018," gov.uk,
<https://assets.publishing.service.gov.uk/media/5f202612d3bf7f1b0fa79fa1/guidance-on-liabilities-under-the-space-industry-act-2018.pdf>. 2018.

⁶⁴ UK Space Agency, "UK Space Agency funding boosts plans for launch from SaxaVord Spaceport and Sutherland Spaceport," gov.uk,
<https://www.gov.uk/government/news/uk-space-agency-funding-boost-plans-for-launch-from-saxavord-spaceport-and-sutherland-spaceport>. December 2023.

⁶⁵ Strategic Headquarters for Space Development. "Basic Plan on Space Policy."
www8.cao.go.jp/space/plan/plan2/kaitei_fy05/honbun_fy05.pdf. 13 June 2023.

⁶⁶ Cabinet Office. "Space Security Initiative." Cabinet Office Website,
<https://www8.cao.go.jp/space/anpo/anpo.html>. 13 June 2023.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

yen to 8 trillion yen by the early 2030s.⁶⁷ Under this objective, in 2023, Japan established the Space Strategy Fund within the Japan Aerospace Exploration Agency (JAXA), totaling 1 trillion yen over ten years, to provide financial support to private companies and universities.⁶⁸ Regarding CLD programs, JAXA is contemplating the idea of linking a Japanese module to the U.S. commercial space station as one of the viable options.⁶⁹

Strategic Competitors

China

In 2017, China announced its ambitions to become the world's dominant space power economically, politically, and military by 2045.⁷⁰ China has highlighted space cooperation as a component of its Belt and Road Initiative, which it refers to as the 'Space Silk Road' or the "BRI Space Information Corridor." In 2022, construction was completed on China's new Tiangong station, which was designed as an alternative to the International Space Station (ISS) operated by the United States, Russia, Europe, Japan, and Canada. However, despite having invited others to join, China remains the sole operator of Tiangong.⁷¹

Russia

About a decade ago, Russia had begun to heavily focus on defense and strengthening defense capabilities through the development of satellites and communications. Their focus on military development have consequently left an underdeveloped civil sector market.⁷² They also have sanctions from the Ukrainian war, which is pushing Russia to work with China since they are having financial troubles.⁷³ Russia wants to separate from the ISS and develop a state-owned Space station.⁷⁴ However, it has been under the microscope for malfunctioning spacecraft equipment, which has questioned Russia's reputation as a credible space program.

⁶⁷ Ministry of Economy, Trade and Industry. "METI's Efforts and the Future in Light of Domestic and International Space Industry Trend."

https://www.meti.go.jp/shingikai/sankoshin/seizo_sangyo/space_industry/pdf/001_05_00.pdf. March 2024.

⁶⁸ The Japan Aerospace Exploration Agency (JAXA). "Establishment of Space Strategy Fund."

www8.cao.go.jp/space/comittee/dai108/siryoushou3.pdf. 13 June 2023.

⁶⁹ The Japan Aerospace Exploration Agency (JAXA). "Part 1 Private Sector Takes Center Stage! Utilization of Low Earth Orbit Post-ISS (ISS & 'Kibo' Usage Symposium 2023)." YouTube, www.youtube.com/watch?v=N695TeHd8Lc. 1 March 2023.

⁷⁰ Goswami, Namrata. "China's Space Ambitions." American Foreign Policy Council, <https://www.afpc.org/publications/policy-papers/chinas-space-ambitions>. April 2023.

⁷¹ Ben-Itzhak, Svetla. The Conversation. "Is the US in a space race against China?" <https://theconversation.com/is-the-us-in-a-space-race-against-china-203473>. April 2023.

⁷² Skibba, Ramin. "Russia's Space Program Is in Big Trouble." Wired, <https://www.wired.com/story/russias-space-program-is-in-big-trouble/>. 20 March 2023.

⁷³ Jones, Andrew. "Russia's War on Ukraine Has Caused Lasting Damage to International Spaceflight Cooperation." Space.com, <https://www.space.com/russia-war-ukraine-damage-international-spaceflight-cooperation>. 7 March 2023.

⁷⁴ Howell, Elizabeth. "Russia Wants to Build Its Own Space Station, as Early as 2028." Space, <https://www.space.com/russian-space-station-ross-2028-timeline>. 28 July 2022.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

CLD Companies

Generally, CLD companies look to the government to set standards and regulations, enhance safety, and minimize risks – both material and financial. After establishing this foundational structure and/or frameworks, they want the government to step aside, allowing for business innovation and the development of the industry. They then expect policy and regulations to evolve based on the industry's lead.

Axiom Space

Axiom Space is the only company authorized to connect its modules to the ISS. This privilege allows Axiom Space to be one of the only companies to adopt and service the multinational user base of the ISS National Laboratory to seamlessly integrate and continue research and manufacturing initiatives. The Axiom Station will host people, research, and manufacturing which will be critical as the expanding infrastructure and operations in space will need an accessible platform for private companies and national governments.

Blue Origin

Blue Origin has partnered with several different companies like Sierra Space, Boeing, and others to develop a “mixed-use business park” in LEO called Orbital Reef.⁷⁵ Orbital Reef is being designed to be the premier commercial destination in LEO as it looks to provide essential infrastructure needed to enable economic activity and open new markets in space. It is being built with the open system architecture which will allow any customer or nation to link up and scale their services and utilities upon demand.

Voyager Space

Voyager Space in partnership with Airbus and other companies are building the Starlab space station in what they call the first science park in space.⁷⁶ The first trans-Atlantic cooperation initiative for a commercial station is planned to be the replacement for the ISS. Hoping to host much of the research and development that the ISS has offered, Starlab is set to be the next-generation ISS.

VAST

Vast is a California-based start-up. In May 2023, Vast announced that it had teamed up with SpaceX to launch its first single-module space station called Haven-1 aboard a Falcon 9 rocket no earlier than August 2025. Haven-1 will be the world's first commercial space station.⁷⁷

⁷⁵ Blue Origin. “Destinations.” Blue Origin website, <https://www.blueorigin.com/destinations>. March 2023.

⁷⁶ Starlab Space. “Home.” Starlab website, <https://starlab-space.com>. March 2023.

⁷⁷ VAST, “Our Mission: Live in Space,” VAST website, <https://www.vastspace.com/>. April 2024.

**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

Research Summary on Existing and Potential Frameworks

UN Frameworks

Outer Space Treaty (1967)

The Outer Space Treaty was signed on 27 January 1967, and it provides the basic framework for international space law.⁷⁸ It outlines important principles guiding space activities. However, these provisions were drafted in broad terms, and as space activities increase daily, there is a need to elaborate on these principles further.

UNOOSA working groups

The UN Office for Outer Space Affairs (UNOOSA) manages and implements the program on the peaceful uses of outer space, aimed at strengthening international cooperation in space activities and in utilizing space science and technology for sustainable development.⁷⁹ Since the adoption of the Moon Agreement in 1979, there have been no international treaties under the UN framework. While the UN General Assembly has served as a major forum for creating soft law, these measures are not legally binding.

U.S. Frameworks

Commercial Space Launch Competitiveness Act (2015)

The US is taking an aggressive and hawkish stance and approach towards developing frameworks/laws for the commercialization of space in general. There is some cooperation amongst friendly allies and space nations but the US seems to have a mentality that they will be the leading power and will take advantage of that through setting the standards and regulations. The United States upset the regulatory status quo – and facilitated the growth of asteroid mining companies – by passing the Commercial Space Launch Competitiveness Act in 2015, a law that grants property rights to the resources on a planetary body (though not to the body itself) to whoever “gets there first.”⁸⁰

Commercial LEO Destinations

The United States' Commercial Low Earth Orbit (LEO) Destinations program is spearheaded by NASA with the primary goal of fostering the development of private-sector-led space stations

⁷⁸ United Nations Office for Outer Space Affairs. "Treaties and Principles on Outer Space." United Nations Office for Outer Space Affairs website, <https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>. March 2024.

⁷⁹ United Nations Office for Outer Space Affairs. "Working Groups - Committee on the Peaceful Uses of Outer Space." United Nations Office for Outer Space Affairs website, <https://www.unoosa.org/oosa/en/ourwork/copuos/working-groups.html>. March 2024.

⁸⁰ Congress. "H.R.2262 - U.S. Commercial Space Launch Competitiveness Act." CONGRESS.GOV, <https://www.congress.gov/bill/114th-congress/house-bill/2262>. 2015.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

that can serve as platforms for research, manufacturing, and other commercial activities in low Earth orbit. This initiative is part of a broader strategy to ensure a sustainable and economically vibrant future for space exploration and utilization, with the private sector playing a crucial role in space activities. Some of the main objectives in the CLD program include: enabling a sustainable LEO economy, ensuring continuous US leadership and presence in LEO, transition from a government-owned to a commercially operated model, and fostering new international and commercial partnerships.

National Frameworks

A lot of states have legislation about licenses, with the United Kingdom having the most sophisticated delineation of licenses for different space activities.⁸¹ There is very limited legislation on governance of LEO activity after the launch phase.

Research Institutes

The Beyond Earth Institute recommends centralizing the regulation of space activities in a single regulatory agency that streamlines the regulation of space activities (recommends that the Department of Commerce become the single regulator) and supporting the insurance industry with government-supported coverage.⁸²

⁸¹ European Space Policy Institute, “Commercial Space Exploration,” [espi.or.at, https://www.espi.or.at/wp-content/uploads/2022/06/ESPI-Executive-Summary-Commercial-space-exploration-1.pdf](https://www.espi.or.at/wp-content/uploads/2022/06/ESPI-Executive-Summary-Commercial-space-exploration-1.pdf). July 2019; Willy Mikalef. “A general introduction to Space Law in France.” Lexology, [lexology.com, https://www.lexology.com/library/detail.aspx?g=7e8d9ee1-71be-4d18-a02a-a36cfb468920](https://www.lexology.com/library/detail.aspx?g=7e8d9ee1-71be-4d18-a02a-a36cfb468920). December 22 2023; Indian Government. “Draft Space Activities Bill, [prsindia.org, https://prsindia.org/files/bills_acts/bills_parliament/1970/Draft%20Space%20Activities%20Bill%202017.pdf](https://prsindia.org/files/bills_acts/bills_parliament/1970/Draft%20Space%20Activities%20Bill%202017.pdf). 2017; UK Space Agency. “UK Space Agency funding boosts plans for launch from SaxaVord Spaceport and Sutherland Spaceport.” [gov.uk, https://www.gov.uk/government/news/uk-space-agency-funding-boost-plans-for-launch-from-saxavord-spaceport-and-sutherland-spaceport](https://www.gov.uk/government/news/uk-space-agency-funding-boost-plans-for-launch-from-saxavord-spaceport-and-sutherland-spaceport). December 2023.

⁸² Andrade, Lauren. “A Framework For The Effective Implementation Of Commercial Space Stations,” Beyond Earth Institute, <https://beyondearth.org/wp-content/uploads/2023/10/Lauren-Article.pdf>. 2023.

**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

Research Summary on Operational Considerations

Export Controls

China Export Issues

China is deepening its relationships in the region and diversifying its relationships across the globe to gain leverage over products, avoid export controls and have access to space launch locations. “U.S. law places limitations on civil space cooperation with China, including through a near-complete embargo on the export of commercial, dual-use, and military technologies with applications in space, and other end-user restrictions. Nevertheless, Chinese companies reportedly have exploited loopholes in existing laws and export control regulations to access U.S. space technology via complex subsidiary investments in U.S. companies. U.S. allies with less restrictive export controls are more willing to trade goods and services from Chinese commercial space companies, strengthening China’s indigenous capabilities.”⁸³ “The Chinese government and military use Hong Kong-based companies to exploit legal loopholes and uneven enforcement in U.S. export controls to gain access to space capabilities which U.S. law prohibits Beijing from purchasing outright. Collaboration with foreign universities, including in the United States, is another important avenue in China’s drive to acquire space technology. Chinese students enrolled in foreign science, technology, engineering, and mathematics programs are treated like employees of China’s defense industrial base, with defense enterprises regularly funding their studies in return for service commitments following graduation.”⁸⁴

Russia Export Issues

To diminish Russia’s capacity to acquire materials employed in weapon development, continuous and vigilant monitoring measures are utilized in cooperation with US allies. “Russia routinely relies on evasive or deceptive tactics, such as the use of third-party intermediaries or transshipment points, to disguise the involvement of parties on the Entity List or SDN List (OFAC’s Specially Designated Nationals and Blocked Persons (SDN) List) in transactions and obscure the true identities of Russian end users, thereby circumventing restrictions. It is critical that exporters and exporters (such as manufacturers, distributors, resellers, and freight forwarders) as well as their service providers (such as financial institutions, logistics companies,

⁸³ House Committee on Foreign Affairs. “China Regional Snapshot: Space - Committee on Foreign Affairs.” *Committee on Foreign Affairs*, <https://foreignaffairs.house.gov/china-regional-snapshot-space/>. 14 Nov. 2022.

⁸⁴ U.S.-China Economic and Security Review Commission. “China’s Ambitions in Space: Contesting the Final Frontier.” <https://www.uscc.gov/sites/default/files/2019-11/Chapter%204%20Section%203%20-%20China%E2%80%99s%20Ambitions%20in%20Space%20-%20Contesting%20the%20Final%20Frontier.pdf>. pp. 359–361. 2019.

Columbia University – Report on Commercial Low Earth Orbit Destinations for the U.S. Department of State

and transportation providers) are aware of the export control risks posed by Russia’s procurement efforts and adopt appropriate measures to counteract such risks.”⁸⁵

Russia’s Relationship with India

The Russia-India space/trade relationship is a broader bilateral relationship heavily focused on defense collaboration, and projects in military equipment production, and by 2023, India became a significant economic partner for Russia, notably increasing imports of Russian crude oil despite Western sanctions over the Ukraine conflict.⁸⁶

Launch Sites

Both American and international space companies with ties to the U.S. government have been launching out of the United States. As Richard Branson noted in 2014, American anti-espionage laws, which include knowledge of U.S. rocket and satellite technology, require certain security measures be taken to safeguard technology that could have a military application. With four FAA-licensed vertical launch sites as well as three spaceports that are non-FAA licensed, American government agencies and private companies have faced issues over the limited number of launch sites. Outside of the United States, there are 41 current and proposed launch sites around the world.⁸⁷

⁸⁵ Bureau of Industry and Security. “Russia Export Controls – List of Common High-Priority Items,” U.S. Department of Commerce Bureau of Industry and Security, <https://www.bis.doc.gov/index.php/all-articles/13-policy-guidance/country-guidance/2172-russia-export-controls-list-of-common-high-priority-items#:~:text=Russia%20routinely%20relies%20on%20evasive,end%20users%2C%20thereby%20circumventing%20restrictions>. April 2024.

⁸⁶ Embassy of India. “Transcript of Press statements of Prime Minister of India Narendra Modi and President of Russia Vladimir Putin following Russian-Indian talks.” <https://indianembassy-moscow.gov.in/press-releases-04-09-19-3.php#:~:text=Russia%20and%20India%20are%20working,in%20Osaka%20on%20June%2028>. March 2024; Pasricha, Anjana. “India, Russia Reaffirm Friendship, Discuss Growing Trade, Strategic Ties.” *Voice of America*, <https://www.voanews.com/a/india-russia-reaffirm-friendship-discuss-growing-trade-strategic-ties/7415611.html>. 28 December 2023.

⁸⁷ “International Affairs.” *Federal Aviation Administration*, www.faa.gov/space/additional_information/international_affairs. 10 April 2024

**Columbia University – Report on Commercial Low Earth
Orbit Destinations for the U.S. Department of State**

List of Interviews

March 21st

- Representative from Taiwan Space Organization
- Debbie McPherson, Director of Business Development, Experior Laboratories
- Elizabeth Anderson, International Program Specialist, Office of International and Interagency Relations, National Aeronautics and Space Administration (NASA)
- SATELLITE 2024 Conference Representatives from: Aerospacelab, Airbus, Argentina, BAE Systems, Boeing, Italian Trade Agency, NanoLab Inc., Mudd Law, Orbital Research Ltd., RocketLab, Sierra Space, SpaceBridge, Taiwan Space Organization, Turkish Aerospace Industries, Inc., VectorNav Technologies

March 22nd

- Rebecca van Burken, Manager of Government and Regulatory Affairs, Voyager Space

March 29th

- Clayton Swope, Deputy Director, Aerospace Security Project and Senior Fellow, International Security Program, Center for Strategic and International Studies (CSIS)

April 3rd

- FAA Office of Commercial Space Transportation, Office of Spaceports ASZ 010

April 4th

- Scott Pace, Director, Space Policy Institute / Professor at the Elliott School of International Affairs, George Washington University

April 7th

- Tristan Prejean, Associate Director of Business Development, Vast

April 8th

- Wolfgang Duerr, Head of Global Business Space Exploration, Airbus

April 10th

- Isaiah Wonnenberg, VP of Regulatory Affairs, Commercial Spaceflight Federation

April 10th

- Cody Knipfer, Assistant to the Chief of Staff, Office of Space Commerce

April 22nd

- Pardeep Singh, Head of Science and Innovation, British Consulate-General in LA