

INTRODUCTION TO THE SYMPOSIUM ON THE NEW SPACE RACE

GOVERNING THE NEW SPACE RACE

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The world is in the midst of a new space race, characterized by three deeply intertwined trends—democratization, commercialization, and militarization. Together, they present novel questions and challenges. The purpose of this symposium is to flesh out their legal aspects through a collection of essays, focusing thematically on the prospects for governance in the years ahead.

Overview of the New Space Race

The first trend, democratization, means space activities are expanding to a growing number of states and non-state actors, distinguishing this space age from one when two powers—the United States and the Soviet Union—were dominant.¹ Democratization² does not, however, mean that states themselves are displaced.³ For the foreseeable future, states will remain central to the international space saga, often as backers and consumers of space technologies and products, prime architects of strategies and policies, and designers of governance frameworks.

The United States, Russia, and Europe remain important. The contemporary difference is the emergence of lesser-known states intent on capturing industrial benefits,⁴ ranging from independent space powers like Japan, China, and India, to entrants such as Australia, Luxembourg, the United Arab Emirates (UAE), Israel, Pakistan, Turkey, and South Africa, to name a few.

Many of these states have unilaterally created space agencies.⁵ Others have capitalized on expertise in a technology, such as Israel with small satellites,⁶ or staked out regulatory niches, such as Luxembourg on space

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¹ WALTER A. MCDUGALL, *...THE HEAVENS AND THE EARTH: A POLITICAL HISTORY OF THE SPACE AGE* (1985); ASIF A. SIDDIQI, *CHALLENGE TO APOLLO: THE SOVIET UNION AND THE SPACE RACE, 1945–1974* (2000).

² Dave Baiocchi & William Wesler IV, *The Democratization of Space*, 94 FOREIGN AFF. 98 (2015).

³ David A. Lake, *The State and International Relations*, in THE OXFORD HANDBOOK OF INTERNATIONAL RELATIONS 41–61 (Christian Reus-Smit & Duncan Snidal eds., 2008).

⁴ See SAADIA M. PEKKANEN & PAUL KALLENDER-UMEZU, *IN DEFENSE OF JAPAN: FROM THE MARKET TO THE MILITARY IN SPACE POLICY* (2010); JAMES CLAY MOLTZ, *ASIA'S SPACE RACE: NATIONAL MOTIVATIONS, REGIONAL RIVALRIES, AND INTERNATIONAL RISKS* (2012); DEGANIT PAIKOWSKY, *THE POWER OF THE SPACE CLUB* (2017).

⁵ See *Welcome to the Australian Space Agency*, AUSTRALIAN SPACE AGENCY (Sept. 2018); Burak Ege Bekdil, *Turkey Moves to Launch Space Agency*, DEF. NEWS (Mar. 2, 2017); *Overview*, SOUTH AFRICAN NATIONAL SPACE AGENCY.

⁶ See *About the Israel Space Agency*, ISRAEL SPACE AGENCY.

resources.⁷ The UAE seeks interagency cooperation to support ecosystems for astronauts, planetary probes, and off-world habitats.⁸ Pakistan may cooperate with China in extending the Belt-and-Road Initiative upwards into a space corridor.⁹

As more states participate, disagreements over legal principles are likely to intensify, including over whether space is a “global commons.”¹⁰ These foreseeable tussles will require us to reconsider the meaning of national appropriation, property rights, and environmental sustainability in outer space.

The second trend, commercialization, layers in critical challenges for designing governance because of “new-space” entrepreneurs intent on profiting from space businesses all the way to off-world settlements. Private actors in the United States have been involved from the onset of the space age; and Boeing, Lockheed Martin, and Airbus have long been prominent in this area.¹¹ The supposed difference now is that rather than just supporting governments, new-space is striking out with its own initiatives.

Projections suggest that the space industry will grow from US\$350 billion today to between US\$1–3 trillion by the 2040s.¹² Whether these rosy scenarios come to pass or not, they have galvanized the development of notable commercial new-space technologies, competition over which forms the heart of the new space race.

One development relates to commercial launch technologies, which promise faster, cheaper, and consistent space access. Private U.S. companies represent the leading edge, including Blue Origin and SpaceX with reusable rocketry, and Rocket Lab with the world’s only private commercial orbital launch site in New Zealand. With government go-ahead for privatization in 2014,¹³ Chinese companies such as OneSpace and LandSpace are also seeking entry.¹⁴ Japan’s Interstellar Technologies shows the trials of privatizing launchers,¹⁵ but some Japanese companies seek to build the country’s first private launch site by 2021.¹⁶

Another development, abetted by the promise of dedicated launch services such as Rocket Lab, is the greater importance given to low-Earth orbit small satellites relative to geostationary spacecraft.¹⁷ Spurred by advances in additive manufacturing and electronics miniaturization, tens of thousands of small satellites are projected to launch in the next decade, transforming prospects for communications and Earth observation. Despite limitations, their cost, speed, scale, and uses appeal to businesses and militaries. By the end of 2018, the United States alone approved 8,000 more small telecom satellites, including proposed internet constellations.¹⁸ Small satellites are also enhancing the prospects of big data from Earth observation, which, combined with artificial intelligence, are seen by governments and firms as decisive for gaining timely decision-making advantages. While new-space firms such as America’s Planet, Finland’s Iccye, and Japan’s Axelspace draw attention globally, the entry of some prominent defense contractors such as Lockheed Martin, Boeing, and Raytheon will affect competition.¹⁹

⁷ See Gov’t of Luxembourg, [Space Resources: Exploring New Frontiers](#).

⁸ [UAE Announces First Astronauts to Go to Space](#), PHYS.ORG (Sept. 3, 2018).

⁹ Saadia M. Pekkanen, [China’s Ambitions Fly High: ‘One Belt, One Road’ to Extend into Space](#), FORBES (May 26, 2017).

¹⁰ J.I. Gabrynowicz, [The “Province” and “Heritage” of Mankind Reconsidered: A New Beginning](#), in *LUNAR BASES & SPACE ACTIVITIES OF THE 21ST CENTURY* (W.W. Mendell ed., 1988).

¹¹ [GLOBAL SPACE GOVERNANCE: AN INTERNATIONAL STUDY](#) 113–18 (Ram S. Jakhu & Joseph N. Pelton eds., 2017).

¹² Jeff Foust, [A Trillion-Dollar Space Industry Will Require New Markets](#), SPACENEWS (July 5, 2018).

¹³ [China Launches Rocket Developed by Private Company](#), XINHUA (May 17, 2018).

¹⁴ Blaine Curcio & Tianyi Lan, [Analysis: The Rise of China’s Private Space Industry](#), SPACENEWS (May 25, 2018).

¹⁵ [Interstellar Technology’s Second Rocket Crashes Seconds After Liftoff in Hokkaido](#), JAPAN TIMES (June 30, 2018).

¹⁶ [Canon and IHI Planning Japan’s First Private-Sector Rocket Launch Site](#), NIKKEI ASIAN REV. (Jan. 27, 2018).

¹⁷ Debra Werner, [Small Satellites Are at the Center of a Space Industry Transformation](#), SPACENEWS (Aug. 22, 2018).

¹⁸ Caleb Henry, [FCC Approves SpaceX, Telesat, LeoSat and Kepler Internet Constellations](#), SPACENEWS (Nov. 15, 2018).

¹⁹ Aaron Gregg, [Defense Giants Bet Big on Small Satellites](#), WASH. POST (Sept. 16, 2018).

One other development brings together autonomous robotics for exploration, resource extraction, and habitats beyond Earth, speaking to newspace visions of off-world expansion. But significant lead times to develop revenue streams present financial difficulties. Two prominent companies, Deep Space Industries and Planetary Resources, serve as cautionary tales; both had to restructure their asteroid-mining business and were acquired by other technology companies, leaving their future space endeavors in this area unclear.²⁰ Japan's ispace hopes to develop a private robotics and resource exploration firm on the moon, and has signed up with SpaceX to get there.²¹ SpaceIL and Israel Aerospace Industries used SpaceX to launch Beresheet, a lunar lander, possibly becoming the first non-governmental entity on the lunar surface.²²

Meanwhile, all celestial bodies—with potential resources such as water, metals, rare minerals, and chemicals—are of high interest to governments. Japan's Hayabusa was the first to return to Earth in 2010 after a seven-year, 6-billion kilometer journey with samples from an asteroid,²³ and its asteroid missions are continuing with Hayabusa2.²⁴ Japan's space dialogue with India, which sent a geologic survey probe now orbiting Mars, includes collaboration on exploration of the lunar polar zone.²⁵ The United States picked nine private companies for future lunar expeditions, including startups Moon Express and Astrobotic.²⁶ China's historic Chang'e-4 landing on the far side of the moon in 2019,²⁷ including its rover's water expeditions and some planetary science experiments, signal the Chinese government's goal of sustaining a human lunar outpost, possibly with international partners.

A far more nuanced lens on the balance between governments and businesses is especially necessary when we turn to the third significant trend in the new space race, militarization.

The challenge here arises, in part, because of the underlying nature of space technologies, 95 percent of which have dual uses in the commercial and military realms. This matters for newspace firms with an eye on viability and profitability in uncertain markets. Despite shifts and downturns in government spending,²⁸ civilian and defense contracts represent a sizeable market for their technologies.

While still small relative to established competitors for government space contracts, SpaceX became one of the top four by 2017²⁹ and is now making inroads into the lucrative market for military space launches.³⁰ In 2018, Blue Origin won a launch service contract from the U.S. Air Force, which will allow it to build out the New Glenn rocket infrastructure for possible use in future national security launches worth potentially billions of dollars.³¹ Rocket Lab aims to launch satellites that help to bring the longstanding military idea of operationally responsive space to fruition.³² Heightened government interest in small satellites means that military intelligence, national intelligence, and defense budgets are moving in favor of their makers for now,³³ as are contracts for military architecture

²⁰ Jeff Foust, *Deep Space Industries Acquired by Bradford Space*, SPACENEWS (Jan. 2, 2019).

²¹ Alan Boyle, *Japan's ispace Strikes Deal with SpaceX for Launches to the Moon in 2020 and 2021*, GEEKWIRE (Sept. 26, 2018).

²² See SpaceX, *Nusantara Satu Mission*.

²³ *Guinness Awards Title to Hayabusa Probe*, JAPAN TIMES (June 14, 2011).

²⁴ *JAXA Says Landing-Site Selection for Hayabusa2's Touchdown on Ryugu Asteroid Is in the Final Stage*, JAPAN TIMES (Jan. 6, 2019).

²⁵ Saki Hayashi, *Japan-India 'Space Dialogue' to Include Surveillance Sharing*, NIKKEI ASIAN REV. (Dec. 9, 2018).

²⁶ Kenneth Chang, *NASA Chooses Private Companies for Future Moon Landings*, N.Y. TIMES (Nov. 29, 2018).

²⁷ *China's Chang'e-4 Probe Makes Historic Landing on Moon's Far Side*, XINHUANET (Jan. 3, 2019).

²⁸ Sandra Erwin, *Space Industry Hit Hard by Military Spending Downturn*, SPACENEWS (Jan. 22, 2018).

²⁹ Sandra Erwin, *Boeing, Lockheed, ULA Corner the Government-Funded Space Market. SpaceX Moving Up*, SPACENEWS (Jan. 22, 2018).

³⁰ Joseph Ax, *SpaceX Launches First U.S. National Security Mission*, REUTERS (Dec. 23, 2018).

³¹ Alan Boyle, *Blue Origin, Northrop Grumman and ULA Win Air Force's Backing for Future Rockets*, GEEKWIRE (Oct. 10, 2018).

³² Jeff Foust, *Rocket Lab to Launch DARPA Satellite*, SPACENEWS (Jan. 22, 2019).

³³ Werner, *supra* note 17.

demonstrations such as Blackjack, in which newspace actors have paired strategically with established defense contractors (e.g., OneWeb with Airbus).³⁴

The other challenge arises from a shifting world order, marked by great power competition.³⁵ Intensifying geopolitical rivalries on Earth today, with all states attempting to shift the balances of space power in their favor, require deep understanding of state intentions and interests.³⁶ While reconfiguring their militaries and emphasizing rules of engagement, states continue to test capabilities such as deep-space missiles, autonomous space planes, and antisatellite weapons, including coorbital systems, jamming, and lasers.³⁷ The growing density of space debris and clean-up technologies also creates security risks. With interest in dedicated military space units rising, the narrative today has shifted from mere space situational awareness to battlespace awareness.³⁸

As a result, countries face an increasing danger of aggression or even open conflict in outer space. These realities raise important legal and policy concerns about militarization versus weaponization of space technologies.³⁹

The Prospects for Governance

The three trends in the new space race are also unfolding in an era noted for treaty decline⁴⁰ and exit.⁴¹ As space law⁴² is embedded in both international and national systems, it remains a “supreme challenge”⁴³ to design global space governance, meaning broadly the formal and informal laws, institutions, processes, and practices that structure relations, stabilize expectations, guide and restrain behavior, and frame policy responses for stakeholders.⁴⁴ How is it all to be done? Six essays turn the lens of existing and emerging legal frameworks on specific topics, drawing out shortcomings and identifying governance pathways forward.

Tanja Masson-Zwaan of Leiden University presents a contemporary overview of a diverse set of stakeholders, poised to shape outer space activities in ways that were not originally contemplated.⁴⁵ She offers one vision of proceeding cooperatively in this multifaceted environment based on the United Nations space treaties and resolutions that have endured over the decades. She is mindful that some of their underlying concepts may well be too vague to be interpreted consensually. Yet she asserts that some of the resulting principles from the 1967 Outer Space Treaty (OST)—the so-called Treaty on Principles—may have achieved the status of customary international law, giving us the international building blocks for thinking about inclusive and consensual state-based collaboration in uncharted domains.

Setsuko Aoki of Keio University in Tokyo provides an expert overview of the ways in which Asian space powers are responding with domestic solutions to the changing conditions of the new space race.⁴⁶ Placing their

³⁴ Pat Host, *DARPA Awards Contracts for Blackjack Small Satellite Programme*, JANE'S DEF. WKLY. (Jan. 16, 2019).

³⁵ Stephen M. Walt, *What Sort of World Are We Headed For?*, FOREIGN POL'Y (Oct. 10, 2018).

³⁶ JOAN JOHNSON-FREESE, *SPACE WARFARE IN THE 21ST CENTURY: ARMING THE HEAVENS* (2017).

³⁷ LAURA GREGO, *A HISTORY OF ANTI-SATELLITE PROGRAMS* (2012).

³⁸ Mary Beth Griggs, *Trump's Space Force Aims to Create 'American Dominance in Space' by 2020*, POPULAR SCI. (Aug. 9, 2018).

³⁹ Fabio Tronchetti, *Legal Aspects of the Military Uses of Outer Space*, in HANDBOOK OF SPACE LAW 333–34 (Frans von der Dunk & Fabio Tronchetti eds., 2015).

⁴⁰ See *Agora: The End of Treaties*, 108 AJIL UNBOUND 30 (2014).

⁴¹ See *Symposium on Treaty Exit at the Interface of Domestic and International Law*, 111 AJIL UNBOUND 425 (2017).

⁴² FRANCIS LYALL AND PAUL B. LARSEN, *SPACE LAW: A TREATISE* 27–48 (2018).

⁴³ Pitman B. Potter, *International Law of Outer Space*, 52 AJIL 305, 306 (1958).

⁴⁴ Saadia M. Pekkanen, *Agents of Design*, in ASIAN DESIGNS: GOVERNANCE IN THE CONTEMPORARY WORLD ORDER 1 (Saadia M. Pekkanen ed., 2016).

⁴⁵ Tanja Masson-Zwaan, *New States in Space*, 113 AJIL UNBOUND 98 (2019).

⁴⁶ Setsuko Aoki, *Domestic Legal Conditions for Space Activities in Asia*, 113 AJIL UNBOUND 103 (2019).

developments in a shifting worldwide context, she focuses on the reasons for and distinctions between the national space acts of China, Japan, and the Republic of Korea, which are signatories to the OST. Provision by provision, she finds that their domestic legal conditions share important commonalities with those found worldwide, which signals their commitment to uphold international space law, ensure the safety of citizens, protect victims from damages, and also promote newspace businesses.

Paul Larsen, who authored a 2018 space law treatise, identifies key elements of the liability regime and its trajectories.⁴⁷ He points to the commercial developments in “space objects” that are likely to change their operators’ liability risk exposure. There are international liability laws applicable to injury and damages caused by the rise of commercial operators; and there will also be recourse for claimants, through their home governments, and in tribunals such as the Liability Convention’s Claim Commission and the International Court of Justice. However, he predicts that claimants will not only increasingly be nonstate—paralleling the rise of commercial or private operators—but that they will likely seek recovery, with potentially bigger punitive awards, in domestic courts based on national tort laws.

Focusing on space resources, Brian Israel—former General Counsel of Planetary Resources and now at ConsenSys, a blockchain technology company—charts an evolutionary shift in space lawmaking, assessing its implications for the international regime supporting diverse stakeholders.⁴⁸ With the prospect of space activities that are both unprecedented and private, national legislatures are wading into controversies over the interpretation and application of the OST in parallel with, or even ahead of, international lawmaking processes. Israel terms this emergent trend Space Law 2.0. He characterizes space resource legislation enacted to date as evidence of “constitutional multipolarity,” in which decentralized lawmaking processes have interpreted and applied the OST as a constitutional source, mitigating regime fragmentation. The treaty’s regime-preserving benefits, however, are not inevitable or without contention.

P.J. Blount, a postdoctoral researcher at the University of Luxembourg, focuses on the rising risks for commercial and military actors in a congested space environment.⁴⁹ In the absence of a regime for standardizing their interactions in orbit, these actors’ expanding activities can be degraded by reasonably foreseeable increases in accidents, miscommunications, and even deliberate acts. The solution to these disparate problems has converged in the concept of space traffic management (STM). Ideally, it means coordination based on technical data and legal standards that clarify the position and operation of space objects at all times for all actors. STM is considered a panacea for space operators, even by militaries with possibly different preferences on the merits of clarity for their operations. In Blount’s view, a sustainable international framework, with negotiations on a new treaty by states, is unlikely to emerge top-down in the current political climate; instead it will emerge from the bottom-up forces of national legislation, liability rules, and best practices among operators.

Matt King of the U.S. Air Force and Laurie Blank of Emory Law School take up the issue of whether and how international law applies to the space domain in today’s challenging political climate.⁵⁰ New actors and geopolitical rivalries are extending to outer space, making it critical to develop a common legal understanding that can provide predictability, clarity, and consistency for military operators worldwide. To that end, existing treaty law is foundational for guiding state behavior, implicating most prominently the two major prongs of the law of armed conflict, *jus ad bellum* and *jus in bello*. However, King and Blank suggest that the unfolding technologies and challenging geophysics make it more likely that incremental processes of state practice, *opinio juris*, and international jurisprudence will be the significant determining factors that affect space security for all actors.

⁴⁷ Paul B. Larsen, *Commercial Operator Liability in the New Space Era*, 113 AJIL UNBOUND 109 (2019).

⁴⁸ Brian R. Israel, *Space Resources in the Evolutionary Course of Space Lawmaking*, 113 AJIL UNBOUND 114 (2019).

⁴⁹ P.J. Blount, *Space Traffic Management: Standardizing On-Orbit Behavior*, 113 AJIL UNBOUND 120 (2019).

⁵⁰ Matthew T. King & Laurie R. Blank, *International Law and Security in Outer Space: Now and Tomorrow*, 113 AJIL UNBOUND 125 (2019).

Looking Ahead

The essays show the enduring prescience of a sixty-one year old observation about the likelihood of diversity in space governance.⁵¹ Informed by principles of the OST, today the multitype design of space governance interweaves hard and soft law, formal and informal organizational structures, and intrastate and transnational interactions.⁵² However, state actions at the international and especially national level will likely have the decisive impact on shaping governance in a strategic industry in the years ahead, affecting balances between government and commercial responses, domestic and global solutions, legal centrality and fragmentation, and conflict and collaboration.

⁵¹ Myres S. McDougal & Leon Lipson, *Perspectives for a Law of Outer Space*, 52 AJIL 429, 429–30 (1958).

⁵² Pekkanen, *supra* note 44, at 11–16, 227–42.