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US Strategy & Space Policy

A Strategic Review of American Posture in Space

March 2025

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Executive Summary

As technological capability evolves, space as part of the US national strategy is more relevant than ever. Space has become a critical aspect of any security policy across private sector innovations, national security, commercial applications, governance models, and global affairs

In NewSpace@Berkeley's first policy report, issues regarding public and private affairs in March 2025—and more broadly across the second Trump administration—are analyzed. In an effort to track space legislation and policy evolutions, updates in commercial events, federal R&D and national strategy, strategic competition, and governance were covered.

As space is used as a tool to both support commercial and consumer interests, the industry is shifting to fit the needs of national security interests. It is observed throughout the paper that, though the current innovations happening both in the public and private sectors, US national security interests require further investment in the aerospace sector. More logistical capabilities and concerns, including supply chain management and strategic competition, require unique solutions and further investment to support the American enterprise.

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Chapter 1 - Commercial

Space Traffic Management

Low Earth Orbit (LEO) and Active Debris Removal (ADR)

To this point, the Trump administration's second term has reaffirmed American commitment to commercially focused, security-driven policy for Low Earth Orbit (LEO) operations while reiterating the call for active debris removal (ADR) as a long-term solution to orbital sustainability[1]. As business and private interest in LEO gains momentum, driven by private space stations, satellite mega-constellations, and national security assets, existing regulatory frameworks remain fragmented, and enforcement mechanisms that address congestion and prevent the proliferation of space debris lack cohesion and enforcement[2]. Administration policies favor deregulation and private sector expansion at the risk of reinforcing systemic vulnerabilities in debris mitigation and equitable access to orbital resources not just for US public institutions but for the entire globe seeking to expand into space[3].

NASA's Low Earth Orbit Economy Plan expansion aligns with the overall space policy objectives of the administration. This means less government reliance on public funds and more private-sector control over LEO's current and future infrastructure. In the absence of a central controlling authority such as an enforcement arm, the threat of market concentration or monopolization exists, with big commercial interests defining the economic, technology, and research landscape of LEO. The abolition of the National Space Council, as directed by current President Trump and ostensibly on the agenda, would further dampen interagency coordination on the regulation of commercial space. This allows regulatory orbital traffic management

[1] NASA. *Commercial Space: Low Earth Orbit Economy.* NASA, 2023, www.nasa.gov/humans-in-space/commercial-space/low-earth-orbit-economy/.
2 Boley, Aaron C., and Michael Byers. "Satellite Megaconstellations Create Risks in Low Earth Orbit, the Atmosphere, and on Earth." *Scientific Reports*, vol. 11, no. 1, 2021, https://doi.org/10.1038/s41598-021-89909-7

3 U.S. Congress. *Orbital Sustainability (ORBITS) Act of 2022.* 117th Congress, 2022, www.congress.gov/bill/117th-congress/senate-bill/4814

and debris mediation gaps to continue proliferating, given the current directives for LEO and ADR under the current administration.

Space Policy Directive-3 (SPD-3), which initially set up a structure for national space traffic management (STM) policy, remains as a guiding document, similar to the Artemis Accords; however, it lacks an enforcement mechanism to ensure compliance. The administration's reluctance to expand STM powers beyond voluntary industry standards emphasizes concerns about orbital sustainability, particularly as satellite constellations increase debris collision risks.

With congressional bipartisan legislative actions such as the Orbital Sustainability (ORBITS) Act by Congress, a government-led active debris removal demonstration program, the administration has yet to show whether ADR projects will receive the necessary funding[4]. Such uncommitted support of debris mitigation policy introduces uncertainty into the long-term LEO congestion management and the current administration's fixation on private LEO proliferation.

By prioritizing private sector initiative over regulatory oversight by the United States government, the administration's space policy continues on a high-risk trajectory for LEO sustainability. The absence of an overt and enforceable framework for ADR and STM management makes commercial and national security assets vulnerable to long-term operational instability that will become progressively more so with each passing day[5].

As global competitors such as China develop their own LEO infrastructure and orbital traffic policies, the U.S. must choose whether to solidify its regulatory stance or risk losing leadership in defining global norms for orbital proliferation and sustainability. With the absence of strategic action or policy, the spread of

4 NASA. *Commercial Destinations in Low Earth Orbit.* NASA, 2023, Humans in space-LEO, https://www.nasa.gov/humans-in-space/commercial-space/low-earth-orbit-economy/commercial-destinations-in-low-earth-orbit/

5 Torbet, Georgina.. "The End of the ISS Will Usher in a More Commercialized Future in Space." *The Verge*, June 2023, https://www.theverge.com/2024/12/7/24314191/iss-end-2030-commercial-space-station-mars-moon

uncontrolled debris and unregulated commercialization would potentially create an unsustainable operating environment in one of the most vital areas for national security, economic growth, scientific advancement, and everyday quality of life[6].

Mars Initiatives

On Monday, March 10, NASA was left without a Chief Scientist, and the Office of Technology, Policy, and Strategy altogether, after yet another cut from Trump's administration in an attempt to reduce waste and DEI efforts.[7] Though Trump has his sights set on Mars and is determined to land humans on the planet, the reality of this happening is hazy – without the Office of Technology, Policy, and Strategy there to provide NASA leadership with "analytic, strategic, and decisional insight in the form of quick-turn analyses, memos, and reports" , as well as research groups and opportunities, Mars initiatives are unclear. With NASA also facing budget cuts to science projects and further cuts to jobs, space exploration through NASA is predicted to be much more difficult.

On the other hand, NASA's budget and job cuts put SpaceX's Mars initiatives at the forefront of space exploration. SpaceX has reached success with its Starship spacecraft, a fully reusable transportation system designed to carry crew and cargo to Mars and beyond. Starship has reached multiple milestones in test flights, desired trajectory, and controlled splashdown, but there is still a way to go before a crewed base is set towards Mars for an extended period of time. Before people can be transported, numerous cargo missions must be completed in order to transport necessary equipment and supplies. To create a sustainable habitat, materials to build domes for crop growth and machines to produce fertilizer, methane, and oxygen are to be transported.

6 NASA Office of Inspector General. *NASA's Management of the International Space Station and Efforts to Commercialize Low Earth Orbit.* Washington, D.C.: NASA Office of Inspector General, 2021, https://oig.nasa.gov/wp-content/uploads/2024/02/IG-22-005.pdf

7 https://www.iflscience.com/nasa-departments-eliminated-as-president-trump-sets-his-sights-on-mars-78379

Once a “rudimentary base” is made, SpaceX hopes to start colonizing Mars. As early as 2029, Elon Musk, SpaceX’s CEO, hopes to send a crewed mission of 12 people to Mars. Once they are established, he is hoping for the development of a self-sustaining colony by 2050. SpaceX’s Mars colonization program aims to send a million people to Mars between 2024 and 2041, with colonies sustaining themselves by splitting CO2 in the Martian atmosphere into its raw components.

Startup Innovation

The private interest in space exploration has boomed over the past ten years. Returning to the lunar surface fell into the sights of many founders, but remained elusive until now. Texas-based Firefly Aerospace touched down on the lunar surface on March 2nd, marking it as the first private company to successfully land on the moon.[8] A private mission landed on the moon last year, but many instruments were damaged on impact. This accomplishment comes after a massive wave of innovation across the private sector, following years of fierce competition stirred by industry disruptors like SpaceX, Blue Origin, and Virgin Galactic.

Startups have demonstrated a wide range of abilities to support space exploration, which will likely result in many deals this year. Several mergers and acquisitions are forecasted over the next few quarters.[9] In solving several niches across the industry, innovators have positioned investors to identify how they can create the next solutions for martian, lunar, and satellite missions.

On March 10, it was announced that former CEO and executive chairman of Google, Eric Schmidt, would be taking over as Chief Executive at Relativity Space.[10] Schmidt seeks to push relativity through the preparation of its mission Terran R, which hopes to compete with SpaceX’s Falcon 9 and Falcon Heavy.

[8] https://www.reuters.com/technology/space/us-firm-fireflys-blue-ghost-moon-lander-locks-lunar-touchdown-2025-03-02/
[9] https://spacenews.com/space-ma-poised-for-takeoff-in-2025/
[10] https://techcrunch.com/2025/03/10/eric-schmidt-joins-relativity-space-as-ceo/?guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmNvbS8&guce_referrer_sig=AQAAANQw4O6-qrewtikg09LizFfIYkEgeVF4TZWnsW7gHhZU0QSVpgZ7jayLVqgzG_cxzA1tvGmLO95Egrsz9nkuPO0cwFcJmu9pHl7P87_ms8JXGkoRhd-P9mMd2hpKayvr5IyHMgRol1mzc8YkUCNvZhlNciImo9UBHrv30jZzBma6

As startups explore ideas beyond the lunar and martian surface, some are seeking ventures with potentially massive returns. Karman+, a Denver-based company, is seeking to mine asteroids with its mission High Frontier. It is reported that Karman+ has raised $20 million to push its engineering capabilities further.

Chapter 2 - Federal R&D and National Strategy

Public-Private Partnerships

As new companies disrupt this space, the Pentagon is shifting away from its historical dependence on the Lockheed and Northrop types. Silicon Valley is seeking to take advantage of the new administration's focus on defense: homeland security. On January 27, President Trump signed an Executive Order (EO) calling for "The Iron Dome For America." The EO seeks out a new missile defense system for homeland security, similar to Israel's Iron Dome. Trump and his advisors have since described this as the "Golden Dome."

"Section 1. Purpose. The threat of attack by ballistic, hypersonic, and cruise missiles, and other advanced aerial attacks, remains the most catastrophic threat facing the United States."[11]

Newer aerospace and defense contractors who have proven their credibility are now racing to pivot toward the Pentagon's interests. In a memo, Secretary of Defense Pete Hegseth called for the Pentagon to seek out strategies to reduce costs by 8% annually and focus on programs that support drone operations. Companies like Anduril Industries, Peter Thiel's Palantir Technologies, and countless other defense-tech companies seek to pounce on this opportunity.

If the current administration views missile attacks on the homeland as the greatest threat to national security, public-private partnerships for at least the next four

[11] https://www.whitehouse.gov/presidential-actions/2025/01/the-iron-dome-for-america/

years will be defined by this. As a result, most aerospace companies will focus on their defense programs rather than space exploration.

The White House

As NASA awaits a confirmed administrator and Congress awaits a National Defense Strategy from the Trump administration, both the public and private sectors are in limbo. While assumptions about the White House's space policy can be modeled from this first Trump term, the administration's efforts to eliminate government waste are hitting all aspects of government, space included. NASA recently announced it would eliminate the role of Chief Scientist and slash its policy division.[12] The National Oceanic and Atmospheric Administration's (NOAA) Office of Space Commerce was also disbanded earlier this month. Amidst widespread layoffs and contract cancellations coming from the Department of Government Efficiency (DOGE), the space industry is growing concerned. With DOGE led by SpaceX CEO Elon Musk, many are concerned about possible conflicts of interest. It is reported that SpaceX holds about $15 billion in NASA contracts.[13]

As President Trump addressed Congress, he made it very clear to Musk and to everyone watching at home that his priority in space will be travel to Mars.

"We are going to lead humanity into space and plant the American flag on the planet Mars, and even far beyond."[14]

Michael Kratsios was recently confirmed to lead the White House Office of Science and Technology Policy (OSTP).[15] As director, Kratsios advises the president on key science and technology issues, especially federal research and development (R&D). Kratisios is entering a tricky office to navigate due to the administration's wide firings of scientists and elimination of many academic contracts. This won't be

[12] https://www.reuters.com/world/us/nasa-terminates-chief-scientist-role-closes-policy-office-2025-03-10/
[13] Ibid
[14] https://www.wsj.com/business/earnings/mda-space-profit-rises-sets-2025-growth-targets-1fc0677d?page=1
[15] https://ww2.aip.org/fyi/ostp-director-nominee-talks-federal-layoffs-and-r-d-strategy

his first time in the office, as he served as the US Chief Technology Officer for all of the first Trump Administration.

Workforce Development

Throughout the Biden-Harris administration, STEM workforce development was a key issue. Congress' passing of the CHIPS and Science Act in 2022 signaled a bipartisan effort to boost our investment in domestic manufacturing, federal R&D, and push for the US to stay competitive in the sciences. Our national space strategy is contingent on developing a strong workforce, not only in STEM spaces, but in the trades, policy, law, and more, to support a complex aerospace and defense ecosystem. Shaping policy on workforce development can be executed in two primary paths: investment in manufacturing and education.

Enabling the US to become less reliant on external supply chains—especially amidst trade uncertainty and increased tariffs—by improving our ability to manufacture on soil will enable massive job creation across aerospace and defense. Moreover, the security concerns associated with the industry are mitigated by conducting more logistical operations in the US.

To create a workforce capable of navigating the complex issues the industry commands, educational investment is necessary. Investments need to be made not only in engineering, but across the sciences and arts to yield a generation ready to support US needs in aerospace and defense.

Artificial Intelligence (AI) and Cybersecurity

In its final days before turning to the Trump Administration, the Biden Administration issued Executive Order 14141[16] on "Advancing United States Leadership in AI Infrastructure", which encourages businesses to develop AI technology in a way that is powerful, secure, and sustainable, while using federal land to do it. It sets

16 https://www.presidency.ucsb.edu/documents/executive-order-14141-advancing-united-states-leadership-artificial-intelligence

rules and deadlines for building and running AI facilities, which include data centers and clean energy facilities. Though this EO is still active and running, President Trump issued Executive Order 14148 on January 20, revoking numerous of Biden's executive actions.[17] Key areas affected by this EO include DEI initiatives, climate and environmental regulations, immigration policies, and Biden's AI Executive Order. Three days later, Trump then signed a second EO, aiming to enhance America's AI leadership.[18] This order urged the development of an AI Action Plan, and successive statements at the AI Action Summit in Paris reiterated the Administration's plan to unleash AI capabilities by means of deregulation, without combatting the potential harm of AI.

Stargate Project: The Stargate Project is a joint venture between OpenAI, SoftBank, Oracle, and MGX which plans to invest up to $500 billion in AI infrastructure across the US by 2029.

Trump nominated Sean Plankey to lead CISA.[19] Plankey is a seasoned cybersecurity expert, underscoring the Administration's efforts to strengthen cybersecurity. However, the Administration also halted funding to two cybersecurity initiatives, including one dedicated to helping local and state election officials.[20] This raises concerns regarding foreign interference in US elections.

17 https://www.insidegovernmentcontracts.com/2025/02/january-2025-ai-developments-transitioning-to-the-trump-administration/

18 https://complianceconcourse.willkie.com/articles/one-month-in-what-we-know-about-the-trump-administrations-policies-on-ai-privacy-and-cybersecurity/

19 https://therecord.media/plankey-nominated-to-run-cisa

20 https://apnews.com/article/election-security-cisa-trump-kristi-noem-6c437543f5d26d890704e5f2a8400502

Chapter 3 - Strategic Competition

Russia and China

The United States, Russia, and China know that the latest and most powerful theater for geopolitical competition is outer space. A rivalry for dominance now spans beyond Earth's surface and encompasses technology, military reach, and alliances in orbit.

China's Multi-Front Space Strategy: Tech, Power, and Access

Trump's return to the presidency in 2025 has added new pressure to an already tense U.S.-Sino relationship. Under his leadership, cooperation between the two space powers appears unlikely, with competition instead expected to accelerate.

While the U.S. recalibrates under the returning administration, Beijing is executing a space agenda built around influence, innovation, and long-term leverage. In fact, it has now entered phase two of its Tianwen deep space series. The first was the Tinawen-1 Mars orbiter that launched in 2020, successfully landed on the Red Planet a year later and will return samples around late 2029. Tinariwen-2, scheduled to launch in the first half of this year, will collect samples from the roughly 40 to 100 meter diameter near-Earth asteroid Kamoʻoalewa (2016 HO3) and deliver them back to Earth around 2026. With a gravitational slingshot maneuver the spacecraft will set course to main belt- comet *311P/PANSTARRS* with a scheduled arrival for around 2034.[21]

Tianwen-3, scheduled for launch in 2028, will then mimic its predecessor by collecting and returning Martian soil samples by 2031 in order to uncover biosignatures and decode geologic and climate history. The China National Space Administration (CNSA) has even called for international participation in their pursuit,

[21] "China's Strategic Ascent in Space: New Dynamics in 2025." *Modern Diplomacy*, 22 Jan. 2025, https://moderndiplomacy.eu/2025/01/22/chinas-strategic-ascent-in-space-new-dynamics-in-2025/.

offering 15 kg of payload on the Earth-return orbiter and 5 kg on the Mars orbiter on March 11, 2025. Proposals are due by June 30, with selection finalized in October. This openness, at a time when NASA's Mars Sample Return mission is facing delays, not only accelerates China's timeline but asserts its leadership in planetary science and diplomacy.[22]

Slated for 2026 and beyond, China's Chang'e-7 and Chang'e-8 will chart the lunar south pole. Chang'e-7 will survey potential resource-rich regions and Chang'e-8 will establish the infrastructure for a permanent lunar research base. These developments mirror core tenets of Chinese military doctrine, where space is not peripheral but foundational to future terrestrial and orbital dominance.[23]

A space-based solar power satellite is also on China's agenda this year. If successful, solar arrays spanning up to six kilometers will beam energy back to Earth via microwave or laser. The economic and geopolitical implications of such an orbital clean energy breakthrough are unquantifiable, especially for nations dependent on energy imports. In tandem, the 2024 success of the Shijian-19 reusable satellite will o be built on with more reusable launch tests this year. Resilient and scalable launch architecture lowers costs and increases cadence, underpinning both rapid-response military payloads and long-term deep space logistics.

China is then expanding not one, but two satellite internet constellations. The Guowang megaconstellation, having begun launches in 2024, will be joined by Qianfan, officially known as the *Spacesail Constellation*. The communications infrastructure is spearheaded by Shanghai Spacecom Satellite Technology (SSST) with support from the Shanghai Municipal Government and the Chinese Academy of Sciences. The constellation Qianfan is expected to provide global internet

[22] Jones, Andrew. "China Opens 2028 Mars Sample Return Mission to International Cooperation." *SpaceNews*, 12 Mar. 2025, https://spacenews.com/china-opens-2028-mars-sample-return-mission-to-international-cooperation/.

[23] https://www.space.com/the-universe/moon/hopping-robot-will-hunt-for-moon-water-on-chinas-2026-lunar-mission

coverage by deploying over 15,000 satellites. The parallel systems not only reinforce China's "digital silk road" of independence but rival Starlink.

Two to three quantum communication satellites will also be launched into low Earth orbit in 2025 in order to advance quantum key distribution (QKD). A medium-Earth orbit QKD satellite slated for 2027 secures the nation's global communications resistant to interception or disruption.

These missions form just one layer of China's strategy to assert influence across the space domain. According to the February 2025 report by the Mitchell Institute for Aerospace Studies, this hypercompetitiveness intimidates U.S. hegemony. Sustained investment, modernization, and a shift in operational posture are imperative if the U.S. Space Force is to meet the demands of an increasingly contested domain.[24] Rapid innovation, agile response to emerging threats, and disciplined execution grounded in a warfighting mindset are non-negotiable. Intelligence should shape both strategy and deployment, while space policy must remain adaptive to prevent institutional inertia across the Department of Defense.

Beyond exploration and infrastructure, China's space ambitions are again backed by a growing arsenal of military and dual-use capabilities. According to the Mitchell Institute, China's broader space posture includes:

- Anti-Satellite Weapons (ASAT): Including direct-ascent missiles, co-orbital interference satellites, and directed-energy weapons to disable or destroy adversary systems.
- Space-Based ISR Capabilities: Supporting real-time monitoring of U.S. military movements and global activity.
- Cyber and Electronic Warfare (EW): Jamming, spoofing, and interference tools capable of disrupting satellite communications without direct attacks.

[24] Galbreath, Charles S., and Jennifer K. Reeves. *Ensuring a Spacepower Advantage in Prolonged Competition: Findings and Recommendations from the Space Endurance Workshop*. Mitchell Institute for Aerospace Studies, Air & Space Forces Association, Feb. 2025. www.mitchellaerospacepower.org.

- Space Blockade Potential: With maneuverable satellites designed to limit access or deny service to critical orbital zones.
- Strategic Civil-Military Integration: Blurring the line between commercial and military space through systems like BeiDou and projects such as Guowang and Qianfan.
- Norm-Setting and Diplomacy: Pursuing rule-making through UN bodies and bilateral agreements that favor China's long-term strategic positioning.
- Cooperation with Russia: Joint tech development, data sharing, and coordinated infrastructure investments, including on the Moon.
- Espionage and IP Theft: Ongoing cyber operations targeting U.S. aerospace firms and agencies to accelerate China's tech base.
- Orbital Debris Risk: Aggressive testing and expansion raise long-term safety concerns for all space actors.

To counter this, the report recommends urgent U.S. action:

- Reconsider bans on space-based defense and deterrent capabilities.
- Invest in AI-enabled space domain awareness and tracking systems.
- Proliferate resilient U.S. satellite constellations across orbital layers.
- Streamline classification to improve intelligence sharing with allies and partners.
- Expand cooperation with the commercial space sector to accelerate innovation and reduce foreign dependencies.
- Strengthen public messaging and congressional understanding of the space threat landscape.
- Shape international space norms that expose and counter China's irresponsible activities.
- Train and equip the Space Force with a warfighting mindset, capable of strategic offense—not just defense.

Into the bargain are China's collaboration with the Kremlin centered on the International Lunar Research Station (ILRS) expected to come into fruition in the 2030s. Joint missions, integrated communications systems, and coordinated robotic exploration should not be taken lightly by the American roadmap for infrastructure and long-term development.

Moscow's Strategic Ascent

Russia will not fall behind in its effort to push forward on multiple space fronts. Russia's trajectory in space is increasingly defined by the dual imperatives of sovereignty and deterrence. The Kremlin's push for autonomous orbital infrastructure, enhanced missile defense countermeasures, and precision anti-satellite systems are of national priority.U.S. space security and allied stability will not remain unaffected.

Underscoring the stakes are Moscow's outrage over Washington's proposed global missile shield announced in January 2025.[25] The space-based sensors and expanded regional missile interceptors of the system is viewed by Russian leadership as a direct challenge to the survivability of its strategic nuclear arsenal. President Vladimir Putin has publicly warned that a new arms race is in risk of being ignited "that extends beyond Earth." Russian defense planners are now expected to accelerate the deployment of next-generation countermeasures, potentially integrating existing early-warning satellites and space-based surveillance with terrestrial interceptor platforms like the A-235 "Nudol." Already tested multiple times, Nudol verifies a maturing direct-ascent ASAT capability capable of targeting low Earth orbit (LEO) assets with high precision.[26]

Compounding the sense of urgency is the uncertain fate of the International Space Station. Escalating geopolitical tensions and the station itself entering its twilight

[25] Trevithick, Joseph. "Russia Slams Trump's Proposed Global Missile Shield." *The Defense Post*, 1 Feb. 2025, https://thedefensepost.com/2025/02/01/russia-slams-trump-missile-shield/.
[26] National Air and Space Intelligence Center. *Competing in Space*. Wright-Patterson Air Force Base, OH, 2019. https://media.defense.gov/2019/Jan/23/2002082151/-1/-1/0/SPACE_GLOSSY_FINAL--15JAN_SINGLE_PAGE.PDF.

years signal Russia's intent to withdraw as early as 2028. The departure would sever decades of scientific collaboration and firmly mark the end of an era. Moscow is actively working to avoid marginalization in the international space ecosystem through the accelerated development of the Russian Orbital Service Station (ROSS).[27] As a multi-module platform in low Earth orbit, ROSS would host both autonomous missions and selective international collaborations on Moscow's terms.[28] Surveillance over the Arctic and Eurasian landmass is enabled by design optimized for high-inclination orbits while its modularity supports continuous upgrades and military applications.

As part of its agreement with China on the ILRS Russia will launch the Luna-26 orbiter in 2027. The polar regions of the Moon's surface will be mapped to unearth water ice and other critical resources. Luna-26 will enhance the operational capabilities of landers and rovers in its function as a communications relay for future lunar missions.[29] 2028 has the Luna-27 mission scheduled for landing near the Moon's south pole, set to conduct in-situ analysis of the lunar regolith. Similar to China, assessing soil composition and detecting volatiles like water ice will inform future technologies for life support and resource utilization.[30]

A further display of the convergence between Russia's defense sector and space policy was President Putin's dismissal of Roscosmos chief Yuri Borisov in February 2025. New appointee Alexei Krivoruchko is a former deputy defense minister with deep ties to the Russian defense-industrial complex. Krivoruchko's portfolio, which includes oversight of missile systems and advanced weapons development, suggests a future where Russia's civilian space agency operates under military logic. This realignment will likely streamline integration between Roscosmos and defense priorities, particularly in the development of co-orbital ASAT satellites.

[27]Handelman, Joshua. *Considerations on the Targeting of Satellites.* 22 Mar. 2021. journals.library.wustl.edu
[28] Turner, Adam. "Russia Risks Being Left out in the Cold as International Space Station Exit Looms, Experts Say." *The National News*, 4 Feb. 2025, https://www.thenationalnews.com/future/space/2025/02/04/russia-risks-being-left-out-in-the-cold-as-international-space-station-exit-looms-experts-say/.
[29]Pieters, Carle, et al. "Russian Lunar Orbiter Mission Luna-26." *43rd COSPAR Scientific Assembly*, 2021.
[30]Chumikov, A. E., et al. "Design, Characteristics, and Scientific Tasks of the LASMA-LR Laser Ionization Mass Spectrometer Onboard Luna-25 and Luna-27 Space Missions." *International Journal of Mass Spectrometry*, vol. 465, 2021, pp. 1–8.

Already deployed in the past year, platforms such as Cosmos 2504 and Cosmos 2519 serve as precursors for maneuverable orbital units capable of tailing, surveilling, and potentially disabling adversary satellites.

Mutual Benefit

In the realm of space policy, a key issue for policy-makers is how investments and innovation in space can benefit life on Earth. While not always obvious, space is key in advancing human life and maintaining strategic competition.

The International Space Station (ISS) has enabled scientific Russia-US relations as well as transatlantic. Experiments conducted aboard the ISS have significant agricultural implications for the future of space exploration and crop growth on Earth.[31]

Much of the governance chapter of this paper demonstrates the importance of US investment and involvement in space. The use of satellites, especially those with synthetic aperture radars (SAR) possesses observational capabilities, crucial to intelligence gathering. It is in the interests of the United States to maintain significant imaging capabilities. In turn, mitigating space debris concerns in LEO is also of utmost importance.

[31] For more, see: https://www.nasa.gov/missions/station/ways-the-international-space-station-helps-us-study-plant-growth-in-space/#:~:text=Experiments%20aboard%20the%20space%20station,like%20those%20grown%20on%20Earth.

Chapter 4 - Governance

Sustainability

As of January 2025, 53 countries have signed the non-binding principles developed by NASA and the U.S. Department of State that are the Artemis Accords. The Accords document the following rules that make up responsible space exploration: Only peaceful purposes can be realized, mission plans should be transparent, sharing of all scientific data, and interoperable systems. Signatories also commit to registering space objects, aiding astronauts in distress, protecting historic lunar sites, and coordinating resource use with no territorial claims. Coordination happens through working groups and major summits. The International Astronautical Congress, or the world's largest global space conference, took place in Milan on October 14, 2024. Nearly 100 delegates from 42 of the 45 signatory countries at the time, along with senior space agency officials finalized technical standards, mission protocols, and joint policy plans.[32]

Yet as diplomatic alignment improves, the physical risks in orbit continue to grow. It is a fact that the rapid pace of satellite launches and the buildup of orbital debris are a serious threat to our safety. The United States is tracking over 36,700 pieces of debris larger than 10 centimeters—each capable of disabling or destroying a functioning satellite. Far more remain undetectable: an estimated 131 million fragments larger than a millimeter are currently in orbit, all traveling at speeds up to 28,100 kilometers per hour. [33] In 2024 alone, the total mass launched into orbit surged by 40%, reaching 1.9 million kilograms, according to the Space Foundation.[34]

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[32]United Nations Office for Outer Space Affairs. *Report on the Status and Implementation of the Artemis Accords*. United Nations, 2025, https://www.unoosa.org/res/oosadoc/data/documents/2025/aac_105c_12025crp/aac_105c_12025crp_16rev_1_0_html/AC105_C1_2025_CRP16rev01E.pdf.

33 Rainbow, Jason. "The Efforts Bridging Space Sustainability, from Best Intentions to Real-World Actions." *SpaceNews*, 10 Feb. 2025, spacenews.com/the-efforts-bridging-space-sustainability-from-best-intentions-to-real-world-actions/.

34 Space Foundation. "The Space Report 2024 Q4 Shows Record Annual Launches." *Space Foundation*, 21 Jan. 2025, https://www.spacefoundation.org/2025/01/21/the-space-report-2024-q4/.

To deal with growing risks in orbit, global organizations are stepping in to create structure and prevent chaos. The United Nations Office for Outer Space Affairs (UNOOSA) hosted the 62nd session of its Scientific and Technical Subcommittee from February 3 to 14. Member states discussed updates to the *Guidelines for the Long-term Sustainability of Outer Space Activities*, including best practices for space debris mitigation, information-sharing protocols, and procedures for satellite conjunction risk assessment. These discussions are part of ongoing efforts to reduce the chance of collisions and improve global coordination on satellite operations.

UNOOSA also supports the United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS), which will hold its 68th annual session in Vienna from June 25 to July 4, 2025. While the Artemis Accords outline a U.S.-led set of principles for responsible behavior beyond Earth, UN COPUOS provides the broader, multilateral forum where those principles can be discussed, challenged, or aligned with global norms.

The International Telecommunication Union (ITU), through its Radiocommunication Sector (ITU-R), has scheduled several expert meetings in 2025 focused on orbital slot allocation and radiofrequency coordination. These include working parties on radiowave propagation models, spectrum management tools, and methodologies for resolving satellite interference. The ITU maintains the *Radio Regulations*, a treaty-level agreement that governs how frequencies and orbital positions are assigned.[35]

Domestically, the NASA Transition Authorization Act of 2025, introduced on March 11, 2025, lays a quiet but firm foundation for space sustainability. While the legislation doesn't use the term explicitly, its priorities—commercialization of low-Earth orbit,

[35] Contant, Corinne, et al. "Toward Net-Zero in Space Exploration: A Review of Technological and Policy Pathways." *Science of The Total Environment*, vol. 914, 2025, 171336, https://doi.org/10.1016/j.scitotenv.2024.171336.

lunar infrastructure, public-private partnerships, and coordinated technology development—support safer, more responsible space activity.[36]

The bill backs NASA's shift from the International Space Station to commercially operated platforms, reducing risks tied to aging infrastructure. It supports responsible satellite disposal and aligns with FCC rules, effective September 29, 2024, that require deorbiting satellites in low-Earth orbit within five years of mission completion.[37] Additionally, the FAA's proposed 2023 rule on upper stage disposal further aligns with these sustainability efforts.[38]

On the Moon, the act supports continued payload delivery under Commercial Lunar Payload Services (CLPS) and proposes the establishment of a lunar time standard, recognizing the growing need to coordinate multinational and private missions. [39]The legislation also promotes coordination across federal agencies in areas like hypersonics, advanced air mobility, and unmanned systems, reducing duplication and regulatory gaps. With $25.5 billion in authorized funding for NASA for FY 2025, the bill ensures continuity across programs, allowing long-term planning and sustainable mission design. In essence, it treats sustainability not as a separate goal, but as the result of strategic coordination, smart infrastructure, and stable investment.

Outside government, pressure is building. Industry-led efforts such as the World Economic Forum's Space Sustainability Rating (SSR) are working to hold operators accountable through independent evaluations of debris mitigation and

36 Cantwell, Maria. "Cantwell, Colleagues Introduce Bipartisan Bill to Reinforce U.S. Space Leadership." *Senator Maria Cantwell*, 11 Mar. 2025, https://www.cantwell.senate.gov/news/press-releases/cantwell-colleagues-introduce-bipartisan-bill-to-reinforce-us-space-leadership.

37 "FCC Adopts New 5-Year Rule for Deorbiting Satellites." *Federal Communications Commission*, 29 Sept. 2022, https://www.fcc.gov/document/fcc-adopts-new-5-year-rule-deorbiting-satellites-0.

38 "FAA Proposed Rule Would Reduce Growth of Debris from Commercial Space Vehicles." *Federal Aviation Administration*, 22 Sept. 2023, https://www.faa.gov/newsroom/faa-proposed-rule-would-reduce-growth-debris-commercial-space-vehicles.

39 Commerce Committee Leaders Introduce Bipartisan Bill to Reinforce U.S. Space Leadership." *U.S. Senate Committee on Commerce, Science, and Transportation*, Mar. 2025, https://www.commerce.senate.gov/2025/3/commerce-committee-leaders-introduce-bipartisan-bill-to-reinforce-u-s-space-leadership

transparency practices. Advocacy groups like the Secure World Foundation are pushing for stronger regulatory frameworks, while public petitions—such as those calling for environmental reviews before satellite megaconstellation launches—signal growing concern on the ground.[40]

National Security

Remote Sensing and Intelligence

As remote sensing capabilities continue to grow, along with the rise in privatization of the space industry and AI integration in research efforts, there is growing concern that worldwide governments may not be able to restrict access to satellite data by private entities, including corporations and potentially hostile actors, such as terrorist organizations. There is also a growing concern in potential privacy and data breaches, harm towards marginalized communities, and an unclear boundary between autonomy and valuable and/or necessary information. This paper outlines a few of the major ethical concerns regarding remote sensing.

Current regulations limit the resolution of commercial satellite imagery to 25 cm. While this prevents detailed observation of individuals and allows for functional and practical use of these satellites (such as for observing crops), international competition may soon challenge these restrictions, potentially undermining U.S. control. The NOAA has also loosened restrictions for obtaining a license for commercial remote sensing in an attempt to boost the US's market power, which poses further ethical concerns.

Recent efforts, such as the reduction of global imaging restrictions by the *Commercial Remote Sensing Agreement (CRSA)*, aim to support U.S. competitiveness by reducing regulatory burdens.

40 Secure World Foundation. "Promoting Cooperative Solutions for Space Sustainability." *Secure World Foundation*, https://swfound.org/.

The NOAA loosening restrictions[41] in order to obtain a license for commercial remote[42] sensing raises questions and concerns regarding the safety and intentionality of the organizations obtaining these licenses. Potentially harmful entities, such as terrorist organizations and undisclosed private companies, could have easier access to sensitive and private information.

Planet Labs, a satellite imagery company based in San Francisco that specializes in remote sensing technology, has been at the forefront of revolutionizing and democratizing the Earth observation industry. They have also been a key player in recognizing the powerful impacts that remote sensing technology can have. For example, Planet is currently signed with NATO to "provide the alliance with high-resolution data from Planet's SkySat fleet as part of the Alliance Persistent Surveillance from Space (APSS) program". A result of this collaboration has been evidence of war crimes in the Russia and Ukraine war, as well as crucial observation and capturing of the war in the Middle East. Planet has played an essential role in bringing to light the atrocities committed by Russia in Ukraine, and has campaigned for the end of the war by providing high quality, real time imagery of the current state of conflict. Planet also played a pivotal part in uncovering where Hamas leader Yahya Sinwar was killed by providing imagery from their SkySat fleet. Though the ethics of satellite imagery can be, at times, questionable, remote sensing is undoubtedly revolutionary and has the extraordinary potential to change the way we view and understand war and similar conflicts.

Supply Chain

Under Section 232 of the Trade Expansion Act of 1962, the President may adjust steel and aluminum imports in the interest of national security. Since President Trump's swearing in, he has placed 25% tariffs on steel and aluminum imports.[43] According

41 https://sia.org/wp-content/uploads/2022/10/White-Paper22-National-Sec-Policy-Dir-27-and-US-Commercial-Remote-Sensing-Policy.pdf

42 https://www.space.commerce.gov/noaa-eliminates-restrictive-operating-conditions-from-commercial-remote-sensing-satellite-licenses/

43 https://www.whitehouse.gov/fact-sheets/2025/02/fact-sheet-president-donald-j-trump-restores-section-232-tariffs/

to the White House, Trump closed loopholes on exempted countries that allowed China to exploit the tariffs. However, the increased tariffs of these critical materials place a strain on the aerospace industry. Forbes estimates that these tariffs will have a direct cost of $5 billion on the aerospace industry.[44]

International Arms Control

As China and Russia develop their space capabilities, the US is positioning itself to develop "counter-space weapons." [45] President Trump's nominee for Secretary of the Air Force (SECAF), Troy Meink, affirmed that the US needs to focus on its space capabilities. During testimony to the US Senate Armed Services Committee, Senators questioned what Meink believed to be most critical for the Space Force. Meink stated, "Some of the space control and counter-space systems are critical… That is probably the area we are being most stressed in from a threat perspective."

Before Meink's appearance before the Senate, the US Space Force (USSF) Chief of Space Operations, General Chance Saltzman, commented on the need for better space weapon options. At the Air & Space Forces Association Warfare Symposium, Gen. Saltzman called for better security of US satellites that support various interests across communications, navigation, intelligence, and missile warning systems.[46]

44 https://www.forbes.com/sites/jerroldlundquist/2025/03/30/the-looming-impact-of-aerospace-tariffs/

45 https://www.airandspaceforces.com/new-secaf-nominee-space-control-weapons/

46 https://arstechnica.com/features/2025/03/what-is-space-war-fighting-the-space-forces-top-general-has-some-thoughts/