

Framing Space Agenda Through Strategic Foresight

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The Changing Global and Space Environment

The United States stands in a different environment than it did when *Space Agenda 2021* was published. While the memory of the pandemic and resulting economic crisis grows faint, the scars linger. The proliferation of artificial intelligence (AI) and social media, along with the ongoing energy transition, has pushed multinational technology companies to the top of stock markets ahead of even the world's largest oil company, and the world continues to grow more interconnected even as some individuals feel even more isolated. Around the world, the nation's adversaries continue to create disruption. Ongoing conflicts in Ukraine and Gaza serve as a reminder of the volatile and uncertain world we live in, especially as we look ahead to how potential future conflicts might unfold. Against the backdrop of simultaneous worldwide conflicts and rapid innovation, and despite rising challenges for the Chinese economy, the post-Cold War world order is being challenged. Access to geographic areas (to include space) of strategic importance, rare earth minerals, and novel technologies continue to be arenas of global competition and are likely to define the upcoming years.

However, the future holds bright spots amidst the uncertainty. As the United States rebuilds its industrial capacity for semiconductors, advancing capability in AI promises new applications and efficiencies, cutting-edge approaches in medicine herald new ways to serve patients, and the desire to scale renewable energies grows, there is immense opportunity on the horizon for the American people.

Shaped by this ever-changing global landscape, space continues to be an embedded part of American lives and a strategic arena of great national importance. The role that space plays across diplomatic, intelligence, military, and economic elements of national power is growing, which makes defense by, to, and through space increasingly important to advancing U.S. interests worldwide. America's adversaries are growing their space capabilities, including with novel threats, and they are demonstrating emboldened actions that require vigilant action by our national security apparatus. To adapt to this changed world within fiscal constraints, the Space Force, along with broader Department of Defense and intelligence space organizations, will rely increasingly on commercial partnerships and capabilities. Currently, shifts are underway toward more distributed architectures that can be more resilient to offensive attacks. The Space Force is also working to update the aging infrastructure of the United States' spaceports, which, if left unfixed, may hinder potential growth of the space economy.

A little farther from home, the United States is also aiming to return astronauts to the Moon and build a moon base in the next few years via the Artemis program, although there is increasing recognition that initial timelines for the missions were unrealistic. As of October 13, 2024, NASA had 45 signatories for the Artemis Accords, which promote a nonbinding common vision for peaceful, sustainable, and transparent cooperation in space. China, joined by 13 nations (including Russia), is leading the development of an International Lunar Research Station (ILRS). The ILRS is intended to be a permanent lunar base established in the 2030s, a process that begins with reconnaissance missions in the next few years. China is also on track to land an astronaut on the Moon before the end of the decade. Beyond the Moon's surface, cislunar space is also becoming an area of interest.

Space debris and orbital traffic coordination continue to be pressing problems with the increased usage of low Earth orbit (LEO) and fielding of satellite megaconstellations. While several companies are developing active debris removal technology, in-space servicing, assembling, and manufacturing (ISAM) technologies are not yet mature enough to address potential collision unless more intentional policy and regulatory approaches are pursued, such as international space traffic coordination, reusability, and life extension. In February 2024, a collision nearly occurred between two nonmaneuverable satellites, one of many to come if preventative measures are not taken. Each collision between orbiting objects can create thousands of pieces of debris and make it significantly more difficult and dangerous to operate satellites. With the continued development of satellite megaconstellations, the number of objects in space is increasing at an unprecedented rate, and other nations will likely ramp up their own megaconstellations in the next several years, increasing the need for international coordination.

The commercial space market saw a major influx of capital beginning in 2020, but now has seen a rebalancing, with investors taking a more critical eye to their investments. While there has been a cooling of the markets and several companies have failed, the large private investments supported significant growth and large strides in technical and operational space capability across data analytics and services, launch, on-orbit servicing, and manufacturing in the past several years. Just one of many examples is that NASA and its partners are planning to deorbit the International Space Station at the end of 2030 and numerous companies are developing their own stations or modules and are betting on a growing demand for microgravity research platforms and space tourism.

Like other areas of U.S. government-shaped endeavor, the space enterprise has suffered due to delays in congressional enactment of key budgets and policies, which have had wide-ranging implications across national security, civil, and commercial space programs and activities. While we tend to address the enterprise through stovepipes, space is already part of a bigger national web of strategic value and must be treated as such. The continued activities of the National Space Council help to enhance executive branch coordination on these complex topics, but continued delays in funding and decisionmaking for space infrastructure and capabilities will have negative impacts on the country in a time of rapid change.

The Space Agenda 2025 Issues Map

The environment that decisionmakers need to navigate is fast moving, complex, and unpredictable. In an attempt to contextualize, but also simplify and focus on the highest-impact and most critical issues that policymakers should address for the space enterprise in the coming four years, the Strategic Foresight Team in the Center for Space Policy and Strategy (CSPS) developed a *Space Agenda 2025* issues map, shown in Figure 1. This map is divided into three key themes:

1. **Strengthening Leadership and Competitiveness.** Acknowledging that being a leader requires proactive shaping across all facets of national power and ongoing development of meaningful collaboration and cooperation with like-minded partners and allies.
2. **Catalyzing Commercial Space.** Stimulating and ensuring a vibrant commercial sector, now and into the future, to advance America's economic, scientific, technological, and national security interests.
3. **Charting Future Value.** Designing and leading in policies that will yield viable economic growth and environmental stewardship of the space industry and deliver greater benefits to the American people and future generations.




Across these 3 categories, the team identified 20 critically important issues to address over the next 4 years. These 20 issues were selected based on the determination that action on them needs to be taken over the next presidential administration. While there are hundreds of other highly important topics and policy areas across different scopes and time horizons, these were carefully selected as a blueprint for the incoming administration to best navigate issues that will have the biggest impact for U.S. leadership writ large. Each issue is described below and accompanied by a set of further reading material published in the last 4 years from CSPS, including the 16 chapters in this volume.

Furthermore, the issues map is divided into three decision categories: the issues where we are behind the curve and immediately need to address, the issues that are emerging and urgent, and the issues that require planting seeds in the near term for the future. These decision categories are meant to serve as a binning construct to prioritize efforts to address the 20 identified issues. While the issues are numbered to ease navigation, those numbers do not represent a further prioritization beyond the binning across the three decision categories.

The Strategic Foresight Team leveraged its expertise in applied strategic foresight and insights from several of its recent cross-enterprise futures studies to assess what we believe are the highest-impact, critical pathways for action that the next administration must address over the next four years. These themes and issues are all connected, as one would expect from the complex domain that is before us. However, it is our hope that this framework offers policymakers a basis to identify, discuss, formulate ideas, and debate strategy on the most critical topics for the nation to address to chart a future for U.S. leadership in space.

SPACE AGENDA 2025 ISSUES MAP



 Behind the Curve
  Emerging and Urgent
  Planting Seeds

*White rings indicates associated Space Agenda 2025 paper

Figure 1. Space Agenda 2025 issues map.

Core Theme

Issue 1: Enabling Space for National Prosperity

Key Question: Why is space in the national interest?

Description: Space provides critical services, inspires through discovery and advancement in science, and protects through critical communications and network systems that defense and rescue staff readily use around the globe. Potential future value, both intrinsic and extrinsic, awaits as the United States further grows, expands, and explores uncharted paths, near Earth and far beyond. Space serves as both a critical function to Americans and a reminder that much of its potential to bring value has yet to be uncovered. Novel medicines, new discoveries about the universe and our place in it, and advancements in food science that could save lives could all await in the future story that unfolds in the space enterprise. The next four years will play a crucial role in laying the foundation for unlocking the future value that space can bring to Americans.

Space Agenda 2025 Chapter:

- ◆ Introduction: Framing Space Agenda Through Strategic Foresight (Kara Cunzeman)

Additional Reading from CSPS:

- ◆ Space Leadership in Transition (November 2019)
- ◆ Strategic Foresight for the Space Enterprise (November 2021)
- ◆ Project North Star: Strategic Foresight for U.S. Grand Strategy (July 2023)

Theme 1. Strengthening Leadership and Competitiveness

Issue 2: Strategic Supply Chains

Key Question: Are our supply chains resilient “enough” now and for the future?

Description: Since the rise of globalization, there has been a drive toward maximizing efficiency in supply chains. For the United States, this often meant relying on raw materials and manufacturing capabilities overseas, even for national security and defense products. The coronavirus disease (COVID-19) pandemic elucidated the fragility and challenges this approach has introduced. Reports are also abundant about force technology transfer and the security concerns around manufacturing critical technologies abroad. Ensuring supply chain resiliency, visibility, and security is thus essential for national security purposes (e.g., ensuring access to materials, manufacturing capabilities, and workforce availability). Additionally, as the space enterprise shifts toward proliferated architectures, the ability to quickly ramp up production and reconstitute may be determined by deep supply chain resiliency and affordability.

Space Agenda Chapter:

- ◆ Strengthening the Industrial Base to Deliver Proliferated Defense Space Systems (Andrew Berglund)

Additional Reading from CSPS:

- ◆ Supply Chain Risk Management (SCRM) Organizational Maturity Model (May 2020)
- ◆ The Green Circularity: Life Cycle Assessments for the Space Industry (April 2023)
- ◆ STAR: Shining Light on Space Supply Chain Risk (July 2023)
- ◆ Mine Games: Securing America’s Critical Mineral Supply (January 2024)

Issue 3: Awareness and Management of Space Traffic

Key Question: What are the risks if the United States does not lead in space traffic management, in setting the rules and norms, and adequately coordinating across the international community?

Description: Space-faring nations are currently facing the importance of setting policies and standards related to space traffic. As nations start to implement rules, it is important for the United States to be aware of the regulations and, in some cases, work in cooperation and coordination with like-minded countries. The U.S. commercial space industry will be impacted by regulations put in place in other countries in which they do business. In some cases, it is possible that the regulations will be stricter than U.S. regulations, resulting in the possibility of high fines for noncompliance. For example, the upcoming European Union Space Law on space traffic may impose certain restrictions or standards on U.S. commercial space companies. Anticipating and understanding upcoming regulations is critical to staying ahead of fines and other consequences. Additionally, the United States must be a leader in setting space traffic standards and regulations to ensure its position as a leader in space is maintained.

Additional Reading from CSPA:

- ◆ Building Norms: A Framework for Space Norm Development (July 2021)
- ◆ Space Traffic Management Terminology (October 2022)
- ◆ No Haven for Misbehavior: A Framework for Verifying Space Norms (March 2022)
- ◆ (Space) Ships Passing in the Night: Translating Maritime Rules of the Road for the Space Domain (December 2023)

Issue 4: Closing the Resiliency Time Gap

Key Question: Are we overoptimizing for the near-term?

Description: The military elements of the operational U.S. space enterprise have been aimed for several years at achieving resilience against known threats and projected operational environments. Several innovations and investments in technology, policy, and process have been intentionally accelerated to achieve resiliency quickly. Despite the significant progress made, there remain significant challenges—less related to known threats and more related to anticipating the attributes of resilient architectures deployed for the long run.

Additional Reading from CSPA:

- ◆ The Hypersonic Missile Debate (January 2021)
- ◆ Designing for Principles: Implementation Steps for the United States Space Force (September 2021)
- ◆ Enabling a New Space Paradigm: Harnessing Space Mobility and Logistics (January 2023)
- ◆ Debate Series: Should the Space Force Have a Warfighting-Centric Culture? (May 2024)
- ◆ FY 2025 Defense Space Budget: Continued Emphasis on Proliferation Under a More Constrained Top-Line (June 2024)
- ◆ The Space Development Agency and the Future of Defense Space Acquisitions (July 2024)

Issue 5: Space's Role in Strengthening Deterrence

Key Question: What actions can policymakers take in the next administration to ensure both that deterrence holds, and if that deterrence fails, that the United States is positioned to restore it swiftly and at minimal cost to the United States, its allies, and its partners?

Description: Since the signing of the Outer Space Treaty of 1967, the space domain has been kept free from the threat of nuclear weapons. In an era of increasing great power tension and changing geopolitical norms, however, whether it remains so is an open question. Policymakers should take steps now to ensure both that our approach to deterrence remains sound in a changing world and that the nuclear complex is prioritized accordingly.

Space Agenda Chapters:

- ◆ ‘Our Most Vital Assets’: Space Ground Infrastructure and U.S.–Foreign Relations (Robert Wilson)
- ◆ Space-Enabled Capabilities for Connecting and Collaborating in the Arctic (Karen Jones and Lina Cashin)

Additional Reading from CSPS:

- ◆ Partnering Not Bossing: Better Leveraging International Capabilities for Space Domain Awareness (August 2021)
- ◆ Charting a Path Through the Space Arms Control Verification Challenge (August 2024)

Issue 6: Leadership in Space as an Instrument of National Power

Key Question: How should the United States boldly lead in space to secure its interests writ large?

Description: To be consistent with existing policies from the national level down to individual agencies and services, the United States should leverage all instruments of national power in its relationships with other nations to promote the common defense and general welfare of its people. As the number of global players invested in space increases in an increasingly uncertain world, the United States will continue to have new opportunities to lead and shape global space norms, especially in collaboration with allies and partners; however, these opportunities could become weaknesses if squandered. Even within the next administration, the United States, for the first time since the 1960s, may be facing near-peer competitors challenging U.S. leadership in lunar exploration. The United States must be ready with a multifaceted strategy that leverages a range of diplomatic, intelligence, military, and economic power to achieve its objectives.

Space Agenda Chapters:

- ◆ The Next Space Security Norm (Robin Dickey)
- ◆ Strengthening a Solid Foundation: U.S. Advantages from Commercial Space (Geoff Reber)

Additional Reading from CSPS:

- ◆ Commercial Normentum: Space Security Challenges, Commercial Actors, and Norms of Behavior (August 2022)
- ◆ No Haven for Misbehavin’: A Framework for Verifying Space Norms (March 2022)
- ◆ Building Normentum: A Framework for Space Norm Development (July 2021)
- ◆ Developing Foundational Spacepower Doctrine (October 2020)

Issue 7: Making National Security Space “Affordable”

Key Question: Why isn’t space getting cheaper?

Description: Much of the rhetoric of budgetary policymakers around national security space is that it’s expensive from the beginning and does not always deliver the capability needed to the integrated mission set. Many current initiatives are justifying shifting from traditional architectures for cost and resiliency reasons. The U.S. government (USG) must consider options to more systematically assess what end-effects are needed to ensure national security and deterrence, what potential solutions are (both leveraging space and terrestrial options), what opportunities exist to scale affordability, and how to ensure that public dollars are being spent in an efficient manner.

Space Agenda Chapter:

- ◆ Why Transforming the Budget Structure Would Benefit Defense Space (Jamie Morin, Lara Sayer, and Robert Wilson)

Additional Reading from CSPS:

- ◆ Issue Brief: FY22 Defense Space Budget Request Analysis (August 2021)
- ◆ FY 2023 Defense Space Budget Brief: Missile Warning and Tracking Looms Large (September 2022)
- ◆ FY 2024 Defense Space Budget Brief: New Priorities and Long-Term Developments Toward a New Architecture (June 2023)
- ◆ FY 2025 Defense Space Budget Brief: Continued Emphasis on Proliferation Under a More Constrained Top-Line (June 2024)
- ◆ Lessons from the Cloud: Outsourcing and Integrating Commercial Space Services (April 2024)

Theme 2. Catalyzing Commercial Space

Issue 8: Ensuring Health of the Space Market

Key Question: What is the role that the USG wants to take in ensuring the commercial space market succeeds?

Description: Across the USG space enterprise, organizations are increasingly looking to leverage “commercial space capabilities” to ensure mission success and sustain the nation’s competitive advantage. This is driven by increased investment in space technologies over the past couple years, with some reports claiming as high as a \$1.1 trillion market size by 2030. However, the path to commercialization and business case closure remains murky for many end applications. A balanced understanding of the benefits and potential risks (e.g., risks to the enterprise if a company dissolves, risk of ending up reliant on a single vendor if that is all the market can support), as well as potential levers to foster the market, is crucial for the USG to understand prior to relying on these capabilities.

Space Agenda Chapters:

- ◆ Anticipating the New European Union Space Law (Michael Gleason and Catrina Melograna)
- ◆ Leverage and Preserve: Need for DOD to Strengthen Support for U.S. Commercial Space (Wei Chen, Mindy Han, Sarah Georgin, and Robert Wilson)

Additional Reading from CSPS:

- Issue Brief: The Future of Civil and Commercial Space Authorization and Oversight (September 2021)
- Assessing Commercial Solutions for Government Space Missions (February 2022)
- Policy Compliance Roadmap for Small Satellites (September 2022)
- Striking a Balance Between Safety and Scrubs (August 2023)

Issue 9: Communicating the Value of Space

Key Question: How does the space enterprise effectively communicate the value of space to the American people and policymakers?

Description: Space is a critical national asset—critical to national security, communications, and the everyday way of life of the America people. Communicating this value of space is required for obtaining citizen buy-in necessary for USG investment and prioritization of space. The space enterprise is responsible for educating and engaging the American

people and their representatives in government on the importance of space, including business opportunities and ensuring the American people understand space's critical role in U.S. leadership. Likewise, U.S. leaders are responsible for ensuring the prioritization of the protection of U.S. space assets and investment in space capabilities.

Space Agenda Chapter:

- ◆ Russia's War in Ukraine: Key Observations About Space (Michael Gleason)

Additional Reading from CSPS:

- ◆ The Value of Space (May 2020)

Issue 10: Bolstering Innovation

Key Question: Is our innovation ecosystem healthy enough to sustain our competitive advantage and is the U.S. government poised to actually leverage innovative ideas?

Description: The incentive structures within both the commercial and government markets push companies away from routine early-stage innovation. Private equity, excess capital, and government funding drive innovation as they allow their recipients the freedom to explore, fail, and rework industry problems. In the space economy where timelines are long, capital requirements are intensive, and opportunities for demonstrating success are scarce, the government must ensure the innovation ecosystem (including academia, corporations, nongovernment organizations, and capital) remains healthy and drives U.S. innovation forward for continued competitive advantage.

Space Agenda Chapters:

- ◆ Space Regulatory Reform Is a Wicked Problem Still Worth Tackling (Brian Weeden and Victoria Woodburn)
- ◆ Rational Exuberance: Understanding Value and Performance in the Space Economy (Karen Jones and Brian Weeden)

Additional Reading from CSPS:

- ◆ Space Game Changers Driving Forces and Implications for Innovation Investments (October 2020)
- ◆ Leveraging Digital Engineering for Space Guardians and Space Explorers (December 2021)
- ◆ Game Changer: A Breath of Fresh Air: Air-Scooping Electric Propulsion in Very Low Earth Orbit (March 2021)
- ◆ Game Changer: In-Space Servicing, Assembly, and Manufacturing for the New Space Economy (July 2022)
- ◆ Game Changer: The Great Convergence and the Future of Satellite-Enabled Direct-to-Device (September 2023)

Issue 11: Investing in America's Future Through Space

Key Question: How do we seed future opportunities for America through space?

Description: Investments in space have helped yield GPS, Tang, and even the modern-day cell phone. Almost every significant advancement in modern society has required an ecosystem of innovation and investments to make what didn't exist possible. What future value will space bring to Americans in the future due to its investments? What policymakers do today to invest in both the infrastructure and the people (through science, technology, engineering, and mathematics [STEM] education, upskilling, and innovation ecosystems that power the future) is critical for seeding future opportunities for America.

Additional Reading from CSPS:

- ◆ Developing Future Space Workers: Leadership Needed Today (April 2021)
- ◆ Clearing Skies in the Forecast for Nation’s Weather Satellites (June 2021)
- ◆ Charting a Course Through Cislunar Master Planning (June 2022)
- ◆ Strategic Foresight: Addressing Uncertainty in Long-Term Strategic Planning (November 2020)

Issue 12: Normalizing Space as a Part of Every Industry

Key Question: How do we make space approachable and bring “non-space” industries into the space ecosystem?

Description: The success of the “space industry” is contingent upon commercial and government markets seeing the value in the domain. However, the community often falsely separates the terrestrial and space markets. In reality, the space domain is part of the overall market space and has the potential to bring value that can be exploited by players to achieve their end goals. Until the space community shifts toward bringing space into the conversation as a key part of every industry, many will continue to not see the value in space and not be interested in investing or working in the arena. Policymakers can help the community create these connections through collaboration ecosystems and investments that bridge the divides that exist today.

Additional Reading from CSPS:

- ◆ Global Communications Infrastructure: Undersea and Beyond (February 2022)
- ◆ The Green Circularity: Life Cycle Assessments for the Space Industry (April 2023)

Theme 3. Charting Future Value

Issue 13: Building a Best-in-Class Workforce

Key Question: What is the responsibility of policymakers today to ensure a diverse workforce of tomorrow?

Description: Space has a place for everyone, and space needs everyone. A diverse space workforce not only provides opportunities for underrepresented groups, but it is also critical for yielding innovation in the space economy. Policymakers must take steps today to ensure equitable access to education across the United States as well as encouraging other nontraditional industries and skill sets to pursue jobs in the space industry. A robust space workforce that includes multiple disciplines (e.g., farmers, artists, doctors, engineers, designers, welders, technicians, construction workers and builders, psychologists, and teachers) is required to build and maintain the U.S. space enterprise. These efforts must start today to ensure we are prepared for a strong space infrastructure tomorrow. Policymakers are responsible for fostering the ecosystem for the space economy to grow and to catalyze the great ideas and diversity that the American potential offers.

Additional Reading from CSPS:

- ◆ Developing Future Space Workers: Leadership Needed Today (April 2021)

Issue 14: Environmental Stewardship

Key Question: Why and how should the United States lead in environmental stewardship?

Description: From protecting Earth’s atmosphere to protecting the surface of Mars, being a leader in space-related environmental stewardship ensures that U.S. values are carried into space. As we scale our space activities, whether in the exploration of celestial bodies or commercializing activities, being responsible stewards becomes more complex. If environments are not greatly considered, space activities have the potential to significantly alter or damage existing ecosystems, resulting in consequences we cannot reverse, including economic viability for space and the United States.

Space Agenda Chapter:

- ◆ The Invisible Link: Key Spectrum Issues for Space (Audrey Allison)

Additional Reading from CSPA:

- ◆ The Green Circularity: Life Cycle Assessments for the Space Industry (April 2023)
- ◆ Implications of a Growing Spaceflight Industry: Climate Change (June 2022)
- ◆ Toward Environmental Accountability: Transforming Satellite Data into Action (August 2021)
- ◆ Issue Brief: A Short Guide for Understanding and Assessing U.S. Space Sustainability Initiatives (April 2021)

Issue 15: Tackling Orbital Debris

Key Question: Why is it critical for the United States to act now to ensure a safe, secure, and operationally viable orbital environment and safe Earth surface in the future?

Description: Space debris is a hot topic today with an increase in the number of satellites in low Earth orbit and space objects reentering. While a Kessler Syndrome scenario may not be in the immediate future, being proactive allows us to start addressing this future possibility now. Waiting for a catastrophe will make reaction and remediation much harder. The United States must put policies in place now to protect the space environment for everyone from the possibility of detrimental effects from a space debris incident.

Space Agenda Chapter:

- ◆ Space Sustainability in the Context of Contested Space (Marlon Sorge and Greg Henning)

Additional Reading from CSPA:

- ◆ Active Debris Removal: Policy and Legal Feasibility (April 2021)
- ◆ Game Changer: Triggers and Effects of an Active Debris Removal Market (January 2021)
- ◆ (Space) Ships Passing in the Night: Translating Maritime Rules of the Road for the Space Domain (December 2023)

Issue 16: Preventing a Day Without Space

Key Question: What choices can policymakers make to strengthen resilience within and across essential space architectures, both on orbit and on the ground?

Description: Space is essential both to national security and to the daily activities of hundreds of millions of Americans, yet space is also increasingly crowded, congested, and contested. What’s more, adversarial actors continue to develop space power for their own interests and to contest American access to and freedom of action in this vital domain. Therefore, the next administration must take action to ensure Americans retain the benefits provided by space.

Additional Reading from CSPA:

- ◆ A Framework for Resilience (April 2019)

Issue 17: Proactive Policymaking for AI in Space

Key Question: What are the opportunities and risks involved with integrating AI systems both on orbit and across the space enterprise at large?

Description: Recent advancements in AI—particularly in machine learning, autonomous systems, and data processing—offer significant opportunities for enhancing space missions. However, while fields of AI have already demonstrated value and others promise value in the future, policymakers must also temper expectations given the hype surrounding tools such as generative AI. In a world of increasingly capable, yet increasingly misunderstood, AI systems, how swiftly, how effectively, and how safely we integrate these capabilities into our on-orbit systems are crucial to the nation. Building upon existing policy frameworks, the administration should focus on making strategic investments that can foster value-added AI innovations applicable for space, to include infrastructure, as well as advancing standards and policies that promote U.S. leadership, security, and responsible use of AI across the space enterprise.

Additional Reading from CSPS:

- ◆ The Future of Ubiquitous, Real-Time Intelligence—A GEOINT Singularity (August 2019)
- ◆ A Framework for Developing Trust in Artificial Intelligence (July 2021)

Issue 18: Inspiring the Next Generation

Key Question: How do we leverage space to catalyze big thinking in America?

Description: While the space community harkens back to its heyday in the 1960s when the nation had full alignment to go to the Moon in a space race against the Soviets, today our interests and investments remain far more varied. Space is also not at the forefront of American minds as it was during the Cold War. We live in an era where a substantial amount of America's workforce is disengaged in the workplace. Additionally, much of Generations Z and Alpha look to the future with fear, rather than hope and excitement. America is missing a huge opportunity to engage these minds to imagine and create better futures and to leverage emerging advancements in space to catalyze these discussions. Space today is on the verge of some very exciting future possibilities for Americans: offering new solutions to food and water scarcity, critical minerals, sparse internet access, power generation, pharmaceuticals, and discoveries we can't yet imagine! Policymakers have the opportunity to engage, inspire, and involve Americans on this incredible ride, and should be creating policies, making investments, and delivering communication campaigns to support inspiring the future.

Additional Reading from CSPS:

- ◆ Pathfinder's Guide to the Space Enterprise (September 2020)
- ◆ Space and Art: Connecting Two Creative Endeavors (February 2021)

Issue 19: Designing Space for Humans

Key Question: How do we design for space so that humans can not only survive, but thrive?

Description: From the beginning of the Space Age, special care has been taken to protect human life in the especially dangerous environments associated with human spaceflight; however, vital components of normal, everyday human life have not been preserved as mission needs have supplanted them. If space is to truly become home for large numbers of people beyond specialized or novel missions off the surface of Earth, then a holistic approach to the design and implementation of human spaceflight systems and frameworks must start with a focus on us humans and the societies we

build—from the ground up. The space elements of the economy won't be able to scale until humans can survive and thrive in space successfully, and those seeds should be planted now if we want that future to be a reality.

Space Agenda Chapter:

- ◆ Mind the Gap: Commercial Space Stations and the ISS (Colleen Stover and Angie Bukley)

Additional Reading from CSPS:

- ◆ Human Spaceflight Safety: Regulatory Issues and Mitigating Concepts (November 2020)
- ◆ Avoiding Costly Delays in Human Space Exploration: Historical Perspectives on NASA Programs (November 2021)
- ◆ The In-Space Rescue Capability Gap (July 2021)

Issue 20: Off-Planet Governance

Key Question: What norms do we want to exist as we expand into cislunar space, the Moon, and beyond and how do we ensure we establish and evolve them successfully?

Description: The United States needs to build up enforcement mechanisms when someone violates norms and/or laws such as the Outer Space Treaty. As China and others look toward tangibly testing the ambiguous governance landscape with upcoming missions to the Moon and beyond over the next four years, the United States has the opportunity to get ahead or react. Policymakers should be planning and assessing a range of choices based on not only what has been done, but what could be done and how that might fundamentally challenge what the United States wants governance and norms to look like off world.

Space Agenda Chapter:

- ◆ Moonstruck! International Aspirations in Cislunar Space (Angie Bukley and Colleen Stover)

Additional Reading from CSPS:

- ◆ Debate Series: High Ground or High Fantasy: Defense Utility of Cislunar Space (May 2024)
- ◆ Pack It In, Pack It Out: Updating Policy and Standards for Cislunar Sustainability (September 2023)
- ◆ Commercial Normentum: Space Security Challenges, Commercial Actors, and Norms of Behavior (August 2022)
- ◆ Building Normentum: A Framework for Space Norm Development (July 2021)
- ◆ Singapore: Country Brief (February 2023)
- ◆ South Korea Country Brief (August 2023)

Charting a North Star Vision

The breadth of issues listed above requires more than just a litany of individual solutions. As the emerging environment is evolving, so too must our policymaking to keep pace and ensure our leadership and relevancy. The next four years will be critical to U.S. leadership in space and far beyond. Our ability to lead in space can be a key component of our broader national leadership.

A largely stovepiped space domain has created numerous obstacles from slow acquisition and integration to classification to evolutionary (not revolutionary) solutions. Without a clear integrated vision for where the country wants to go, the United States risks its competitive advantage and could be giving up opportunities to advance the nation and deliver benefits to its people. A whole-of-nation vision and a compelling picture for how space should support it will put America in a stronger position, now and in the future.

The incoming administration has the opportunity to set such a bold new vision. It can articulate the aspirations for where we want to go, why we want to go, and how space contributes, encompassing the full space enterprise—civil, commercial, and national security. Such vision is not solely about space but how space can serve. It’s about how it improves American lives, helps chart U.S. leadership in the 21st Century and beyond, and inspires the next generation along the way. To do so, our vision requires not only clarification about what America wants for space, but more broadly what America wants of its future. We have the tools and approaches to manage uncertainty and imagine these futures, but we need leadership to help the nation trailblaze a collective course to get there.¹

The future is made in the present. The incoming administration has the opportunity to chart a bright American future in the coming years. It is our hope that this *Space Agenda 2025* issues map and collective chapters in this body of work can play a role in helping decisionmakers bring that to fruition for the nation and its people.

Special Acknowledgments

Many thanks to the following individuals for their contributions to *Space Agenda 2025* issues map and to the Strategic Foresight Team.

Kara Cunzeman	Paul Frakes
Catrina Melograna	Caleb Bailey
Sarah Georjin	Maya Harris
Zachery Tyson Brown	Will Vasquez

References

¹Project North Star: Strategic Foresight for U.S. Grand Strategy (July 2023)

About the Author

Kara Cunzeman is the director of strategic foresight and lead futurist for Strategic Foresight for the Center for Space Policy and Strategy at The Aerospace Corporation. In her role, Cunzeman is focused on cultivating a formalized methodologies in futures thinking, helping the enterprise adequately prepare and proactively shape the future through innovative approaches across strategy, acquisition, S&T portfolio management, policy, and operations. Prior to working at Aerospace, Cunzeman held roles in space systems engineering, vehicle operations, and space sensor development at Raytheon and General Atomics. She was also a key contributor to winning Phase II funding from a NASA small business in innovation (SBIR) award for extracting oxygen from lunar soil while at Packer Engineering. Cunzeman received her bachelor's degree in multidisciplinary engineering and master's degree in aeronautics and astronautics engineering from Purdue University. She is also a certified foresight practitioner and guest instructor at the Institute for the Future, the Center for Intelligence Studies, International Space University, and George Washington University.

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This paper was published as a chapter of *Space Agenda 2025*, with Angie Bukley, Colleen Stover, and Victoria Woodburn serving as editors in chief. *Space Agenda 2025* is an effort by the Center for Space Policy and Strategy (CSPS) at The Aerospace Corporation to highlight and provide insights into some of the major space challenges facing policymakers. You can find the complete list of individual *Space Agenda 2025* papers at <http://csps.aerospace.org/SA2025>, as well as download the combined set of 16 chapters in the *Space Agenda 2025 Compendium* at <https://csps.aerospace.org/papers/space-agenda-2025-compendium>, all available to you with our compliments.

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