



# **SPACE REGULATORY REFORM IS A WICKED PROBLEM STILL WORTH TACKLING**

Brian Weeden and Victoria J. Woodburn

## **Executive Summary**

Rapid growth in U.S. commercial space has yielded important benefits for civil and national security space capabilities. Continued commercial space growth and innovation depends in large part on further modernization of the policy and regulatory environment that enables and promotes those commercial activities. As a result, presidential administrations and Congress have grappled with reforming the space regulatory regime many times over the last few decades, with some major successes but also many remaining challenges.

The breadth of space regulatory issues that need reformation is vast, each with its own unique set of stakeholders, existing regulations and policies, executive branch regulators, congressional authorizers and appropriators, and economics. Despite this complexity, the next U.S. administration must continue the good work that has been started by previous administrations and make the difficult decisions to resolve the seemingly perpetual debates that have persisted for decades. To that end, we offer several recommendations for the next presidential administration:

- ◆ Space regulatory reform is an urgent issue and should be pursued assiduously. The longer it takes to make key decisions, the likelier it is that there will be consequences for future U.S. commercial space sector viability and government programs and policy goals that rely on commercial space.
- ◆ While space issues are often cross-cutting, the next White House must decide which topics can be handled at the agency level and which ones require a full interagency process to resolve. Pulling everything up to the interagency level will reduce the available bandwidth to tackle the breadth of issues that need resolving.
- ◆ As much, if not more, political capital should be spent on implementation of policy decisions as on their formulation. It is easier to announce a decision than it is to actually implement change.
- ◆ Engage constructively with Congress early and often in the process. Very few of these problems can be resolved exclusively by the executive branch and many require the executive and legislative branches to reach an agreement.

## Introduction

One of the consistent themes in the space world over the last two decades is the rapid growth in the activities of the commercial sector. While commercial space has been around in some form since the 1960s, it has expanded from satellite communications to remote sensing of Earth, space launch, and most recently, human spaceflight and in-space servicing, assembly, and manufacturing.

This growth in commercial space activities has accelerated over the last four years. For example, the United States hosted 36 launches in 2020.<sup>1</sup> By 2023, that number grew to 117 U.S. launch attempts, the vast majority of which was driven by an increase in commercial launches.<sup>2</sup> The variety of space activities has also grown, with commercial companies attempting or planning missions involving commercial space tourism, orbital debris removal, space-based manufacturing, and space resource extraction.

Multiple U.S. agencies have put in place policies and strategies to leverage the innovation, speed, and cost savings of the commercial space capabilities for government missions. The National Aeronautics and Space Administration (NASA) was an early adopter and today relies on commercial capabilities to transport people and cargo to and from the International Space Station and plans on using commercial capabilities for critical parts of the Artemis program to return to the Moon. Additionally, the Department of Defense (DOD) is also seeking to leverage commercial assets and services for a variety of national security missions. In April 2024, the DOD and U.S. Space Force (USSF) released commercial space strategies to guide increased partnerships and engagement with commercial space actors. Likewise, the National Oceanic and Atmospheric Administration (NOAA) is evaluating using commercial space-based data for weather forecasting.

To effectively leverage the advantages of commercial space capabilities, such capabilities need to exist in the first place, and their existence is heavily impacted by the policy and regulatory oversight framework put in place by the federal government. Currently, regulation of U.S. commercial space activities primarily falls under the jurisdiction of three agencies. The Federal Aviation Administration's Office of Commercial Space Transportation (FAA/AST) has authority for licensing launches and reentries as well as private spaceports. NOAA's Office of Space Commerce regulates private remote-sensing satellites. Lastly, the Federal Communications Commission (FCC) regulates non-federal use of the radio-frequency spectrum. In addition, the Department of Commerce (DOC) and State Department both play a role in licensing the transfer of controlled technologies to non-U.S. entities as part of the export control regime.

These existing authorities have developed over several decades and, as commercial space activities continue to diversify and increase, the limitations of this existing framework have become apparent. Commercial innovation has outpaced some of the existing regulatory processes, and there are planned activities that don't clearly fall under the existing authorities. There are long-standing tensions between the private sector and the national security community over the potential threat that commercial use of dual-use technologies could pose. There is also a lack of clearly refined processes or authority for supervision and authorization of so-called "novel" activities that fall outside the existing categories listed above. These challenges are complex and difficult enough that several past administrations have tried to address them, but many challenges still exist for the next administration to resolve.

As a result of these challenges, oversight and regulation of commercial space exemplifies what is known in public policy as a "wicked" problem. In this context, wicked problems are defined in distinction to tame problems: it is difficult to define all the necessary variables, there's not a clear stop condition when the problem is completely "solved," you can't test all possible solutions, and there are many different stakeholders with different interests or even definitions of what a good solution or outcome might be.<sup>3</sup> Many of the tools developed in math, science, and engineering to solve tame problems are unable to deal with wicked problems, yet wicked problems often involve some of the most critical public policy issues to address.

This paper provides an overview of the history and breadth of federal regulation and oversight of the commercial space industry and its enduring challenges. Additionally, it highlights potential actions that the next presidential administration could take to ensure continued U.S. leadership in commercial space activities. A clear and predictable regulatory regime can ensure U.S. leadership and safety while also promoting commercial growth and innovation. By contrast, ill-defined, opaque, slow-moving, or overly cumbersome regulations risk hindering the growth of the U.S. commercial space sector during a time when the U.S. government is becoming increasingly reliant on it.

## Challenges to Commercial Space Regulation

The debate over how to modernize oversight of commercial space activities is largely a function of the complexity of the system. This complexity relies on a myriad of factors, some of which are unique to the space industry while others are common across emerging technology areas. Some of the challenges unique to space include the international treaty obligations that pertain and the diverse number of government stakeholders. Alternatively, tensions between both regulating and promoting industry and dual-use technologies can be found across multiple sectors. The convergence of these challenges, plus emerging political dynamics, makes regulating commercial space more challenging than many other sectors.

The most unique aspect of space regulation is the international obligation for the U.S. government to regulate its private sector space activities. Article VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (The Outer Space Treaty) states that “States Parties to the Treaty shall bear international responsibility for national activities in outer space... whether such activities are carried on by governmental agencies or by non-governmental entities” and such activities “shall require authorization and continuing supervision by the appropriate State Party to the Treaty.”<sup>4</sup> As a party to this treaty, the U.S. government is responsible and liable for its space activities and those of its citizens, including commercial activities, and has created its oversight regime, including national space policies and regulations, as part of fulfilling its authorization and supervision responsibility. The biggest impact of this obligation is that governments must be more involved in oversight of space activities than many other areas.

Many additional challenges to regulating commercial space are not unique to the space sector. These shared challenges include the dual-use nature of the technologies that have both defense and non-defense applications, disparate and overlapping regulatory authorities across multiple federal agencies, significant links to national security and sovereignty, and growing international competition. Additionally, regulatory agencies are also tasked with competing priorities in both having to regulate the commercial space industry while also promoting its growth.

Public policy is still an exercise in balancing competing interests and priorities, and that balancing act is both shifting and getting more complicated when it comes to space regulation. National security and public safety have historically been among the most important priorities, but that is waning with the globalization of space technologies and the growing recognition of the socioeconomic benefits from wider access to space applications. Promoting and growing the commercial space sector is increasingly important for driving innovation but could undermine traditional actors and public safety if it happens too fast. All of the expansion and growth in space is also in tension with ensuring the long-term sustainability of space activities, for both current users and uses as well as those in the future.

Historically, the United States has taken a prescriptive approach to commercial space regulation, resulting in regulations that often are slow to adapt to evolving technology or the increased growth of the commercial space sector activities. As the pace of technological change within the commercial space sector is evolving faster than regulators can respond, a number of current and emerging commercial space activities fall into a regulatory gap outside of current regulations. This gap can cause delays in getting commercial activities approved, resulting in added costs and disproportionately impacting small companies and startups.

On top of these policy questions is a layer of political considerations. Regulation is a term that has a variety of political connotations and implications. The major U.S. political parties have different philosophies for the role of government in providing oversight of the private sector, such as what should be considered in that oversight and how light or heavy a regulatory touch the government should take. These philosophies can even differ within a political party, depending on the technology or sector, and are evolving over time. The political context adds yet another layer of complexity in making progress on this topic.

Additionally, comprehensive commercial space regulation will require a whole-of-government approach. While the FCC, FAA, and NOAA are the primary regulatory agencies when it comes to commercial space operations, a range of other agencies, including the DOD, NASA, Department of Energy, Department of State, and more, has a stake in the industry. Different agencies have their own missions and authorities that can lead to differing approaches to regulation as well as occasionally overlapping interests and regulatory authorities. Creating a regulatory regime that satisfies all stakeholders and streamlines the process among them for commercial actors is a complicated process.

Lastly, the United States is not the only country currently revising and updating its commercial space regulation. For example, New Zealand recently put in place the world's first regulatory framework for satellite servicing<sup>5</sup>, and the European Commission is expected to soon reveal a space law for the European Union.<sup>6</sup> Many other countries have or are developing their own regulatory frameworks as part of enabling their own commercial space industries and influencing international norms and standards. If the United States wants its commercial industry to compete internationally, then it must also consider the impact of international regulatory regimes on U.S. companies. If U.S. regulations are markedly different than those of international partners, it will make international business more difficult as well as create potential interoperability challenges between allies and partners.

All three failure modes from not addressing these challenges—lack of certainty, overly cumbersome regulations, or total absence of regulation—pose risks to U.S. leadership in space. An unclear regulatory environment may, in turn, cause uncertainty in the long-term viability of commercial space activities that deters investors from investing in new space technologies or entrepreneurs from working in this space, prompt questions about whether the United States is fulfilling its international treaty obligations, and create liabilities U.S. taxpayers could be on the hook for. If U.S. companies are hindered by regulation, the United States may lose access to certain commercial capabilities due to companies' inability to stay financially viable and innovate. U.S. companies may also turn to "flags of convenience" and register their operations in countries with more permissible regulatory environments. While this poses a clear issue for U.S. competitiveness, it could also lead to a less safe space environment, which, in turn, could lead to additional risks and costs of operating in space that are borne by U.S. government and commercial space operators.

## **Current Issues and Debates**

Several previous administrations have grappled with the challenge of modernizing the space regulatory framework, with varying degrees of success due to the persistent challenges outlined above. These efforts can be grouped into reform of the existing regulations for commercial remote sensing and launch and reentry, reform of the existing spectrum regulations to incorporate large broadband constellations, and development of new regulations to cover emerging commercial space activities, including human spaceflight.

***Commercial Remote Sensing of Earth and Space Objects.*** Commercial remote sensing of Earth was one of the earliest areas in which the United States established regulations, driven by the competing desires to promote private sector enterprise and protect national security. In 1992, Congress passed the Land Remote Sensing Policy Act, which provided continuity for the previously government-controlled Landsat satellite program by shifting it to a commercial procurement model.<sup>7</sup> This shift was accompanied by the authorization of the Secretary of Commerce to license private sector parties to provide remote-sensing space systems, which was further delegated to NOAA. Although the attempted commercialization

of Landsat failed, the licensing framework was developed, and multiple commercial companies began operating to provide satellite imagery of Earth.

The main challenge with the commercial remote-sensing regulations was that they imposed significant restrictions, known as “conditions” in regulatory parlance, on U.S. commercial companies to protect national security. These included restrictions on the quality and types of imagery that could be captured, along with certain locations on Earth that could not be imaged. The existing regulations also prohibited commercial spacecraft from imaging other space objects and commercial radar imaging entirely. The restrictions were opaque and difficult for new companies to navigate, and there was little to no option for recourse. Meanwhile, very few of the same restrictions were imposed on foreign companies operating outside the United States. Over the last two decades, these dynamics led to a thriving global remote-sensing market that U.S. companies could not fully compete in and several categories of remote-sensing products that were only available from foreign companies.

While discussions about how to resolve this situation occurred during the Obama administration and before, it was the Trump administration that began a formal review. Space Policy Directive 2 (SPD-2), “Streamlining Regulations on Commercial Use of Space,” issued on May 24, 2018, directed the DOC to “review and rescind or revise” the existing regulations for commercial remote sensing on a relatively short deadline of 90 days.<sup>8</sup>

NOAA kicked off their formal revision of the existing regulations on June 29, 2018, with a request for public input to questions posed across an array of topics.<sup>9</sup> On May 14, 2019, NOAA published their draft proposed rule, which introduced a new two-category framework based on the risk posed by the remote-sensing system and a higher bar for imposing custom conditions on a licensee. NOAA received significant feedback from industry, both in support of the reforms but also indicating that they did not go far enough.

On May 20, 2020, NOAA published their final rule for public comment, which was significantly revised based on the previous inputs.<sup>10</sup> The final rule created three tiers of licenses and associated conditions but crucially based those tiers on the current state of the international market instead of a pre-defined set of criteria. The highest tier, and the most conditions, would be restricted to commercial remote-sensing capabilities that were unique to U.S. companies, and foreign companies offering those same capabilities on the open market would automatically trigger a reduction in tier (and restrictions). Furthermore, special conditions could only be imposed on entirely novel capabilities for a maximum of three years.

The revised commercial remote-sensing regulations were largely embraced by industry, and NOAA has stood by the new process they created. In August 2023, NOAA announced that the 3-year window had elapsed and they had removed 39 individual temporary conditions, while a few had been extended at the request of the DOD.<sup>11</sup> Notably, many of the new U.S. commercial remote-sensing capabilities now allowed under the revised regulation are being used to support Ukraine in its war against the Russian invasion.<sup>12</sup> Remote sensing is thus one of the regulatory issues that has seen impactful policy change in the last 20 years.

**Commercial Space Launch and Reentry.** Commercial space launch is another sector that saw early development of a regulatory framework driven by the political desire to foster a commercial sector. On May 16, 1983, the Reagan administration issued National Security Decision Directive (NSDD) 94, “Commercialization of Expendable Launch Vehicles,” to encourage the development of private sector space launch capabilities for the benefit of the United States.<sup>13</sup> A little over a year later, in October 1984, Congress passed the Commercial Space Launch Act, which authorized the Secretary of Transportation to license private sector space launches from the United States or by its citizens.<sup>14</sup>

For the next two decades, actual commercial space launches were fairly limited until the period of radical change and growth that happened within the last decade. This change created a significant set of challenges for the existing regulatory framework, which were developed under the assumption that commercial space launches would be relatively infrequent,

take place from a few specific locations owned by the U.S. government, and would happen independent of subsequent reentries.<sup>15</sup> The proliferation of potential spaceports across the United States, rapid increases in the overall number and cadence of commercial launches, shifting rockets between multiple pads and sites, and landing and reuse of rocket stages presented major challenges under the existing framework.

The most recent major revision of the launch regulatory framework was also directed by the Trump administration as part of SPD-2 in June 2018, which directed the Secretary of Transportation to “review and rescind or revise” the existing space launch regulations within 120 days.<sup>16</sup> While FAA/AST undertook a similar process to revise its launch and reentry regulations as NOAA did for remote sensing, the outcome was not seen in as positive a light by many in industry.

In April 2019, FAA/AST published its initial draft rulemaking of the revised launch and reentry regulations for public comment.<sup>17</sup> The public submitted more than 150 comments, along with many questions, and voiced significant concern for the scope and direction of the revision.<sup>18</sup> FAA/AST released the final version on October 15, 2020, which took effect on March 10, 2021.<sup>19</sup> It made significant changes that addressed many of the shortcomings of the old regulations, including a shift in philosophy from a prescriptive approach that specified how to meet a requirement to a performance-based approach that only specified what the goal was, instead of prescribing a specific solution to meet that goal, leaving more room for innovation.

However, the launch industry still expressed concerns over the new regulations. A large portion of this stemmed from its length (more than 600 pages as a PDF file) and the large number of unspecified details on how it would be implemented. In response, FAA/AST indicated that it would issue a series of advisory circulars to further clarify how it would be implemented over the coming months. During a congressional hearing in October 2023, industry witnesses called for Congress to request additional reforms to the launch licensing process.<sup>20</sup> In February 2024, FAA/AST announced it would establish a new committee to solicit industry input on how to improve a new launch licensing process.<sup>21</sup>

**Commercial Human Spaceflight.** Separately, there has also been continued debate over how the United States would, or should, regulate commercial human spaceflight, including suborbital and orbital tourism and future commercial space stations. In December 2004, Congress passed the “Commercial Space Launch Amendments Act of 2004” that directed the Secretary of Transportation to encourage, facilitate, and promote commercial launch vehicles designed to carry humans.<sup>22</sup> While Congress authorized FAA/AST to update its regulatory framework to include human spaceflight, it also imposed a moratorium, commonly referred to as the “learning period,” of eight years before FAA/AST could impose regulations on the safety of individual spaceflight participants or crew beyond what is necessary to protect public safety<sup>23</sup>~~(O&B)~~.

During the intervening two decades, and particularly in the last few years, commercial human spaceflight has advanced and had some spectacular successes towards enabling suborbital space tourism. However, the sector has generally not progressed as fast as originally thought. While Scaled Composites won the original XPRIZE challenge in 2004, it wasn’t until July 11, 2021, when Virgin Galactic was able to successfully make its first commercial tourist flight, with Blue Origin following shortly thereafter. As a result, Congress has periodically extended the learning period, most recently extending it to January 1, 2025.<sup>24</sup> In the meantime, there are few regulations on how commercial companies can protect passenger safety, outside of mandatory disclosure of the inherent risks of spaceflight.

The debate over how long it will take for industry to mature enough and for FAA/AST to learn enough to end the learning period continues. On the one side, much of industry is arguing strongly that it is still too early to impose what might be burdensome regulations that end up stifling innovation. On the other side, others are concerned that the lack of regulations for some activities might lead to a tragic loss of life that itself will smother the industry through public outcry, loss of investor confidence, and higher insurance premiums.

**Large Satellite Constellations.** The third major existing regulatory framework for commercial space involves the FCC and their oversight of the radio-frequency spectrum. Here, the biggest recent challenge has been the re-emergence of large constellations in low Earth orbit (LEO) to provide broadband communications. This concept was originally floated in the late 1990s by several companies and involves large numbers of satellites—hundreds to thousands or more—and complicated questions about mitigating interference between use of the same radio-frequency spectrum by other terrestrial and space applications.

Although the original attempts at developing these constellations were largely unsuccessful, technological advances in miniaturization and cloud computing, along with reductions in the cost of space launch, have led to a rediscovery of the concept in the mid-2010s. In 2016, a company called WorldVu filed a request with the FCC for authorization to use the spectrum allocated for the original LEO broadband constellations. In response, the FCC opened up new processing rounds to any other companies who wanted to use the same allocations, prompting a flurry of applications of varying maturity. The FCC then proposed adding additional domestic spectrum allocations to support this emerging service, which, in turn, resulted in a much bigger flurry of complex activity at the International Telecommunication Union (ITU), the United Nations–specialized agency that maintains the international radio regulations to enable radio operations without harmful interference from other countries. The ITU regulations are agreed to by Member States at each World Radiocommunication Conference (WRC) and include making global and regional spectrum allocations and conditions for their use.

The biggest challenge in this spectrum-coordination process was how these new satellite broadband services would co-exist with one another and with other space and terrestrial services that operate in the same or nearby frequencies without causing harmful interference to these operations. There is only one radio-frequency spectrum, and only certain parts of it are suitable for transmissions through the atmosphere. Still other parts of the radio-frequency spectrum are especially good for specific applications and are in high demand by both space and terrestrial users. Adding in the costs and engineering challenges of developing practical applications, the end result is increasing congestion and risk of interference by the growing number of radio-frequency spectrum users and uses.

While the spectrum-coordination process for large constellations continues to be sorted out by national administrations and ongoing (and intensive) ITU studies, there are still other oversight aspects of large LEO broadband constellations that are unresolved. The existing regulatory system was designed to handle spectrum allocation and coordination matters and had lots of experience and expertise in doing so. However, this regulatory system was not designed to handle the other emerging oversight questions resulting from putting tens of thousands of new satellites into orbit, such as those concerning orbital debris mitigation and physical congestion, environmental impacts of space activities, and light pollution that affects astronomy.

Orbital debris mitigation itself is not a new concept; the United States has had national policy for orbital debris mitigation for almost the last forty years.<sup>25</sup> Each successive presidential administration since Ronald Reagan has included orbital debris mitigation in their national space policies and gradually built upon the requirements laid down by their predecessors. In 2006, the George W. Bush administration’s national space policy formally directed the Department of Transportation (DOT), DOC, and FCC to include orbital debris mitigation in their licensing of commercial space activities.<sup>26</sup> Subsequent administrations have continued this focus on orbital debris mitigation and added improving space situational awareness and removal or remediation of existing orbital debris as well.

Thus, in addition to spectrum management, the FCC has also spent several years working through a formal rulemaking process on what the orbital debris mitigation standards should be for all the satellite systems they license and has established some initial rules.<sup>27</sup> The FCC’s focus on orbital debris mitigation as part of its large constellation licensing process has also generated controversy. The authority for the FCC to include orbital debris mitigation in its licensing stems from both executive policy and its own interpretation of its regulatory authorities to protect public interest, but not everyone agrees that it has a clear grounding in congressional legislation. But at the same time, there are no other U.S. agencies that

have licensing authority over large constellations, so others have applauded the FCC for filling what otherwise might have been seen as a gap in the United States' ability to carry out its international obligations. The FCC has also used its unique position outside the executive branch as an independent agency to put in place requirements that go beyond the Orbital Debris Mitigation Standard Practices (ODMSP) that are the baseline for other departments and agencies.

With the recent Supreme Court decisions of *West Virginia vs. Environmental Protection Agency*<sup>28</sup> and *Loper Bright Enterprise vs. Raimondo*<sup>29</sup>, the FCC's orbital debris mitigation regulations and further regulatory activity from agencies may face intensified scrutiny if they fall outside of the agency's authorizing statute. *West Virginia* increased the focus on having explicit legislative authority for regulatory powers, and *Loper Bright* changed the deference given to regulator expertise in interpreting authorities and determining regulatory standards. Together, these ruling could result in challenges to the FCC's orbital debris mitigation guidelines and the executive branch's authority to set orbital debris mitigation standards.

The questions around light pollution and environmental impacts of large constellations remain unresolved. Current FCC rulings conclude that outer space is not an environment that falls under the National Environmental Policy Act (NEPA) and, as such, environmental impact analyses are not required for activities in space. However, there is growing concern about the carrying capacity of heavily used orbital regions and also emerging scientific research that suggests the reentry of large quantities of metals into the upper atmosphere may have significant effects on the upper stratosphere.<sup>30</sup> Several large-constellation operators are working with the astronomy community on ways to lessen the visible brightness of their satellites, but these efforts remain voluntary, and it is unclear whether the FCC has authority over optical interference. These are all challenging problems that will need to be addressed by the next administration.

**“Novel” Space Activities.** In addition to updating the current processes for regulating the existing private sector space activities outlined above, several administrations have also looked at how to authorize and supervise so-called “novel” space activities that do not clearly fall into the existing framework. Examples of these activities include in-space refueling, active removal of space debris, commercial space stations, and commercial activities on the surface of the Moon. Formal action on this topic was officially kicked off as a result of the U.S. Commercial Space Launch Competitiveness Act (CSLCA), which became law on November 11, 2015.<sup>31</sup> Section 108 directed the Office of Science and Technology Policy (OSTP) to assess the current authorization and supervision framework and provide recommendations to Congress within 120 days. On April 16, 2016, John Holdren, then director of OSTP, submitted the Obama administration's official response, which was a proposal for creating “Mission Authorization” framework, modeled on the FAA's existing Payload Review Process and intended to be a “light touch” approach instead of a comprehensive regulatory framework.<sup>32</sup> The legislative proposal attached to Holdren's letter proposed that the DOT be given the authority for mission authorization. The DOT was also the agency leading the Obama administration's interagency work on space traffic management (STM).<sup>33</sup>

However, implementation of this approach was not completed before the end of the Obama administration and the 114th Congress, leaving the matter in the hands of the incoming Trump administration. While the Trump administration largely maintained much of the substance already developed by the Obama administration, they did switch the lead agency for STM from the DOT to the DOC in Space Policy Directive 3, issued on June 18, 2018.<sup>34</sup> The National Space Policy released by the Trump administration on December 9, 2020, also stated that the DOC should take the lead in implementing mission authorization of novel space activities.<sup>35</sup> Once again, the new authorities contained in these policies were not enacted by Congress before the end of the Trump administration's term and the 116th Congress in 2020.

The Biden administration picked up this issue in March 2022, when Vice President Kamala Harris tasked the National Space Council with developing a proposal for authorization and supervision of novel space activities.<sup>36</sup> The White House held a pair of “listening sessions” in November 2022 to solicit input from the private sector as part of the process.<sup>37</sup> Before the Biden administration could release their official proposal, Republicans in the House of Representatives introduced the Commercial Space Act of 2023 on November 1, 2023, which proposed that the DOC take on a very narrow set of



authorities to issue “certifications for the operation of a space object.”<sup>38</sup> The Biden administration released their legislative proposal two weeks later, which proposed to split mission authorization between the DOT and the DOC,<sup>39</sup> followed by a policy framework to support the legislative proposal on December 20, 2023.<sup>40</sup>

As of October 2024, this issue of how to authorize and supervise novel space activities remains unresolved. The proposals from the White House and House of Representatives are fundamentally at odds. Meanwhile, some senators have criticized the White House proposal’s split between the DOC and the DOT, as has the National Space Council’s Users’ Advisory Group and prominent industry groups.<sup>41</sup> No alternative legislation has been officially proposed in the Senate at the time of publication of this article. In the meantime, novel missions, such as satellite life extension and lunar landers, are being authorized by the FCC or other agencies on an experimental or ad hoc basis.

**Export Control Reform.** An additional area of space regulation that has been particularly difficult to reform is export controls. Starting in 1976, commercial satellites were categorized under the U.S. Munitions List (USML), which is controlled by the Department of State’s International Traffic in Arms Regulations (ITAR), due to the dual-use nature of the technology. In the 1980s, the Reagan administration and Congress moved some satellite technologies to the Commerce Control List (CCL), which falls under the DOC’s less-restrictive Export Administration Regulations (EAR), to enable U.S. companies to use foreign launch capabilities.

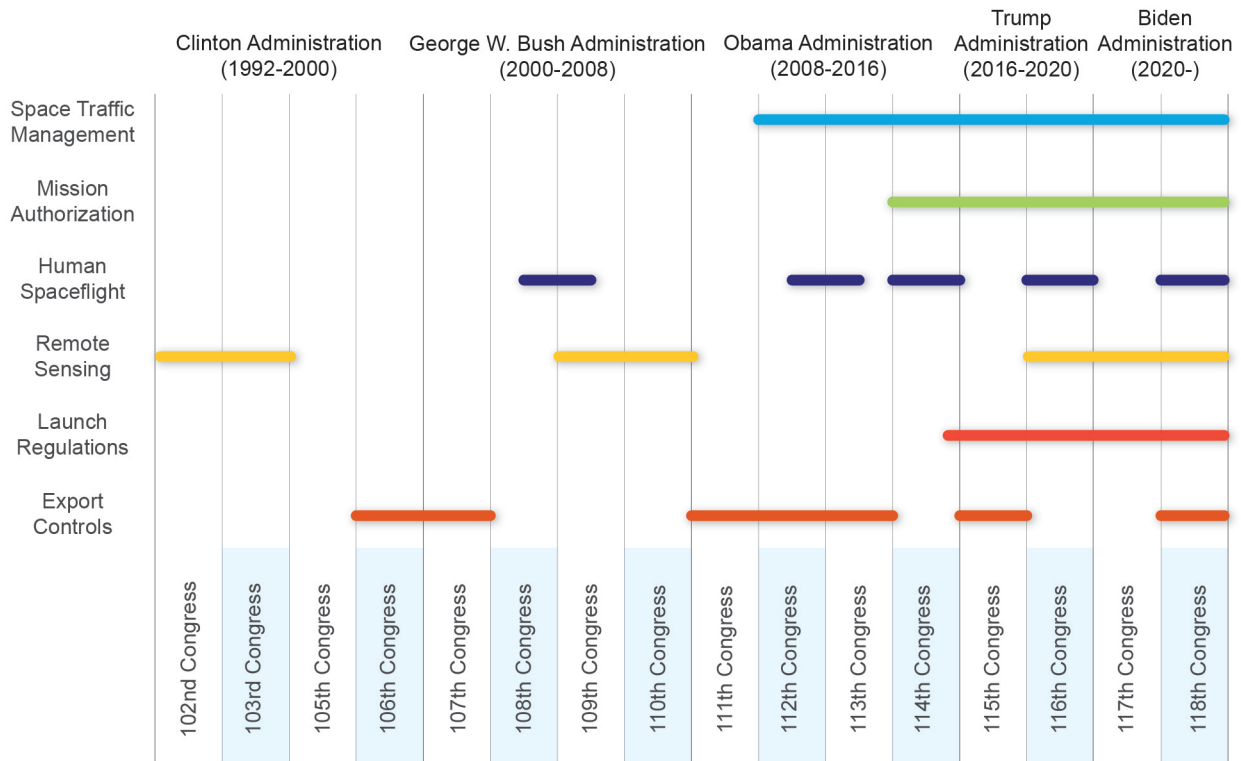
In the 1990s, export controls on space technologies became a much bigger political issue. Following a series of launch failures of U.S. payloads on Chinese launch vehicles, a few U.S. companies provided China with technical data and analysis as part of the mishap investigations. An investigation by Congress into broader Chinese theft of U.S. technology concluded that the launch failure analyses were in breach of existing export controls, used by China to improve the reliability of its space launch vehicles, and could potentially be used to improve the performance of its ballistic missiles used for nuclear deterrence.<sup>42</sup> The report also found lapses in enforcement of existing protections on satellite technical data used by space insurers and other commercial entities.<sup>43</sup> Congress subsequently returned all space technologies to the USML, placing them once again under ITAR, and upped enforcement.

During the Obama administration, pressure from industry led to a major effort to reform space export controls. Analysis provided by the Satellite Industry Association showed that placing all space technologies under ITAR led to 40 percent drop in the U.S. share of the global space market since 1995 as other countries aggressively marketed so-called “ITAR-free” satellites that could be more easily obtained by foreign entities.<sup>44</sup> The Obama administration worked within Congress to pass legislation that gave the executive branch the authority to determine which technologies could be moved to the CCL, while continuing the strictest export controls for a list of specific countries, including China.

Both the Trump and Biden administrations have also focused on reforming space export controls. The Trump administration’s SPD-2, in addition to kicking off the reforms of remote sensing and launch regulations discussed above, also directed the executive secretary of the National Space Council to “initiate a review of export licensing regulations affecting commercial space flight activity” and provide recommendations.<sup>45</sup> While Congress did pass the Export Control Reform Act of 2018, there were no significant effects on the space industry or further changes to export controls under the Trump administration.<sup>46</sup> In April 2024, under the Biden administration, the State and Commerce Departments announced that they would start a process in the summer of 2024 to update space systems on export control lists.<sup>47</sup> In October 2024, the Biden administration released a set of final and proposed changes to space export controls that created exemptions for specific allied partners and moved several categories of technologies from the USML to the CCL.

## Priorities for the Next Administration

It should be clear from the short history lesson above and the graphical summary shown in Figure 1 that there has been a significant amount of focus on space regulatory reform over the last 20 years, but tangible results have been few and far between. These areas are persistent wicked problems that do not have clear “right” answers, and all of them involve



**Figure 1: Executive branch or congressional activity on space regulatory issues over time.\***

balancing uncertain costs and benefits while navigating an entangled set of bureaucratic relationships and governmental politics. There will not be any easy answers or quick resolutions to any of them, no matter the amount of political capital invested. That said, these are still issues the next U.S. administration needs to tackle. Incremental, positive change can lead to significant improvements over time.

Our first recommendation is that reforming the space regulatory and oversight regime must be dealt with urgently. Issues such as deciding who has the authority for mission authorization have been under debate for more than a decade, long past the time they should have been decided. The longer they remain unresolved, the greater the chances for negative impacts on the commercial sector and loss of U.S. global leadership on space.

Our second recommendation is that the next administration needs to decide which of these issues can be handled at the agency level and which ones require the White House to convene an interagency process to resolve. The latter is important for dealing with topics that involve multiple constituencies across the executive branch but is time consuming for both the White House and the participating agencies. The next administration must also decide which issues are the highest priority for expending their interagency attention and which other issues can be handled primarily at the agency level with the White House still holding those agencies responsible for completing the task.

Our third recommendation is to focus as much, or more, political capital on implementation of policy decisions as on their formulation. It is easy to announce that a policy review is underway, more difficult to actually develop a policy proposal that is acceptable to all the stakeholders, and extremely difficult to ultimately implement a policy to yield real change.

\*The bars shown in this figure are estimates based off formal executive branch activities, such as interagency policy working groups, rulemaking processes, and procedures, and legislative activities, such as introduction or consideration of legislation and hearings. It is meant to give a representative depiction of overall work on these issues and should not be considered authoritative.

Finally, we recommend that the next administration work constructively with Congress on these issues. While there are a few elements of regulatory reform that can be done entirely within the executive branch, the most pressing and complicated questions are ones that require legislative action. Some of the historical delays on resolving these questions were a result of administrations not working with—or in some cases actively working against—Congress. Recent Supreme Court rulings will also require increased clarity from Congress in specifying the authorities for each of the involved agencies. The next administration must find a way to actively engage with Congress to convey the importance of working on these issues and coming to a compromise solution that can be accepted by all stakeholders.

## **Conclusion**

The continued growth and evolution of the commercial space sector represents great opportunities and complex challenges for the U.S. government. A vibrant and innovative commercial sector is a key advantage the United States has over every other space nation. Supporting and enabling the sector's continued growth is critical to maintaining U.S. leadership in space, achieving a wide range of policy goals, and meeting our international treaty obligations. At the same time, this growth and innovation create a variety of policy and regulatory challenges that the U.S. government has historically not easily dealt with for a variety of structural and bureaucratic reasons.

The next U.S. administration must focus significant energy on this topic. It needs to continue the good work that has been started or accomplished by previous administrations while also making difficult decisions to resolve the seemingly perpetual debates that have existed for decades.

## References

- <sup>1</sup> “Orbital Launches of 2020,” Gunter D. Krebs, last modified May 4, 2024, [https://space.skyrocket.de/doc\\_chr/lau2020.htm](https://space.skyrocket.de/doc_chr/lau2020.htm).
- <sup>2</sup> “Launch Attempted by Country and Category, 2023,” The Space Report, Space Foundation, published 2024, <https://www.thespacereport.org/resources/launch-attempts-by-country-and-category-2023/>.
- <sup>3</sup> Rittel, H.W., & Webber, M.M. “Dilemmas in a General Theory of Planning,” *Policy Sciences*, Vol. 4, No. 2, pg. 155-169. 1973.
- <sup>4</sup> *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies*, United Nations Committee on the Peaceful Uses of Outer Space (January 27, 1967), [https://www.unoosa.org/pdf/gares/ARES\\_21\\_2222E.pdf](https://www.unoosa.org/pdf/gares/ARES_21_2222E.pdf).
- <sup>5</sup> “New Zealand National Statement Agenda Item 7: Space Debris,” Committee on the Peaceful Uses of Outer Space Scientific and Technical Subcommittee, (February 6–17, 2023), [https://www.unoosa.org/documents/pdf/copuos/stsc/2023/Statements/8\\_AM/7\\_New\\_Zealand\\_8\\_Feb\\_AM1.pdf](https://www.unoosa.org/documents/pdf/copuos/stsc/2023/Statements/8_AM/7_New_Zealand_8_Feb_AM1.pdf).
- <sup>6</sup> “EU to delay space law, constellation contract,” Jeff Foust, SpaceNews, published April 15, 2024, <https://spacenews.com/eu-to-delay-space-law-constellation-contract/>.
- <sup>7</sup> Congress.gov. “H.R.6133 - 102nd Congress (1991-1992): Land Remote Sensing Policy Act of 1992.” October 28, 1992. <https://www.congress.gov/bill/102nd-congress/house-bill/6133>.
- <sup>8</sup> Executive Office of the President. “Streamlining Regulations on Commercial Use of Space.” *Federal Register* 83, no. 104 (May 30, 2018): 24901. <https://www.federalregister.gov/documents/2018/05/30/2018-11769/streamlining-regulations-on-commercial-use-of-space>.
- <sup>9</sup> National Oceanic and Atmospheric Administration. “Licensing Private Remote Sensing Space Systems.” *Federal Register* 83, no. 126 (June 29, 2018): 30592. <https://www.federalregister.gov/documents/2018/06/29/2018-14038/licensing-private-remote-sensing-space-systems>.
- <sup>10</sup> National Oceanic and Atmospheric Administration. “Licensing of Private Remote Sensing Space Systems.” *Federal Register* 85, no. 98 (May 20, 2020): 30790. <https://www.federalregister.gov/documents/2020/05/20/2020-10703/licensing-of-private-remote-sensing-space-systems>.
- <sup>11</sup> “NOAA Eliminates Restrictive Operating Conditions from Commercial Remote Sensing Satellite Licenses,” Office of Space Commerce, National Oceanic and Atmospheric Administration, published August 7, 2023, <https://www.space.commerce.gov/noaa-eliminates-restrictive-operating-conditions-from-commercial-remote-sensing-satellite-licenses>.
- <sup>12</sup> “JUST IN: Ukraine War Called ‘Catalyst’ for Space-Based Remote Sensing Industry,” Stew Magnuson, National Defense Magazine, published March 22, 2022, <https://www.nationaldefensemagazine.org/articles/2022/3/22/ukraine-war-called-catalyst-for-space-based-remote-sensing-industry>.
- <sup>13</sup> President Ronald Reagan, *Commercialization of Expendable Launch Vehicles*, National Security Decision Directive Number 94, (Washington, DC: White House, 1983): 1-6, <https://csp.aerospace.org/sites/default/files/2021-08/Commercialization%20of%20ELVs%20May83.pdf>.
- <sup>14</sup> Congress.gov. “H.R.3942 - 98th Congress (1983-1984): Commercial Space Launch Act.” October 30, 1984. <https://www.congress.gov/bill/98th-congress/house-bill/3942>.
- <sup>15</sup> Straubel, M, “Commercial Space Launch Act: The Regulation of Private Space Transportation,” *Journal of Air Law and Commerce*, Vol. 52, No. 4. 1987. <https://scholar.smu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=1804&context=jalc>.
- <sup>16</sup> Executive Office of the President. “Streamlining Regulations on Commercial Use of Space.” *Federal Register* 83, no. 104 (May 30, 2018): 24901. <https://www.federalregister.gov/documents/2018/05/30/2018-11769/streamlining-regulations-on-commercial-use-of-space>.
- <sup>17</sup> Federal Aviation Administration. “Streamlined Launch and Reentry Licensing Requirements.” *Federal Register* 84, no. 72 (April 15, 2019): 15296. <https://www.federalregister.gov/documents/2019/04/15/2019-05972/streamlined-launch-and-reentry-licensing-requirements>.
- <sup>18</sup> “FAA expects revised launch regulations to be completed next fall,” Jeff Foust, SpaceNews, published October 10, 2019, <https://spacenews.com/faa-expects-revised-launch-regulations-to-be-completed-next-fall/>.
- <sup>19</sup> Federal Aviation Administration. “Streamlined Launch and Reentry License Requirements.” *Federal Register* 85, no. 238 (December 10, 2020): 79566. <https://www.federalregister.gov/documents/2020/12/10/2020-22042/streamlined-launch-and-reentry-license-requirements>.
- <sup>20</sup> “Launch industry asks Congress for regulatory reforms,” Jeff Foust, *SpaceNews*, published October 19, 2023, <https://spacenews.com/launch-industry-asks-congress-for-regulatory-reforms/>.
- <sup>21</sup> “FAA to establish committee to refine launch licensing regulations,” Jeff Foust, SpaceNews, published February 23, 2024, <https://spacenews.com/faa-to-establish-committee-to-refine-launch-licensing-regulations/>.
- <sup>22</sup> Congress.gov. “H.R.5382 - 108th Congress (2003-2004): Commercial Space Launch Amendments Act of 2004.” December 23, 2004. <https://www.congress.gov/bill/108th-congress/house-bill/5382>.
- <sup>23</sup> U.S. Library of Congress, Congressional Research Service, *Commercial Human Spaceflight Safety Regulations*, by Rachel Lindbergh, IF12508 (2024).

- <sup>24</sup> U.S. Library of Congress, Congressional Research Service, *Commercial Human Spaceflight Safety Regulations*, by Rachel Lindbergh, IF12508 (2024).
- <sup>25</sup> Weeden, Brian, “The Evolution of U.S. National Policy for Addressing the Threat of Space Debris,” *67<sup>th</sup> International Astronautical Congress*, IAC-16.A6.8.3. September 2016.
- <sup>26</sup> Presidential Memoranda, “U.S. National Space Policy,” August 31, 2006. <https://csp.aerospace.org/sites/default/files/2021-08/Natl%20Space%20Policy%20fact%20sheet%2031Aug06.pdf>.
- <sup>27</sup> Federal Communications Commission. “Mitigation of Orbital Debris in the New Space Age.” *Federal Register* 89, no. 36 (February 22, 2024): 13276. <https://www.federalregister.gov/documents/2024/02/22/2024-03506/mitigation-of-orbital-debris-in-the-new-space-age>.
- <sup>28</sup> *West Virginia v. Environmental Protection Agency et al.*, 597 U.S. 1 (2022).
- <sup>29</sup> *Loper Bright Enterprises et al. v. Raimondo, Secretary of Commerce et al.*, 603 U.S. 1 (2024).
- <sup>30</sup> Murphy, D; Abou-Ghanem, M; Cziczko, D; Froyd, K; Jacquot, J; Lawler, M; Maloney, C; Plane, J; Ross, M; Schill, G; and Shen, X. “Metals from spacecraft reentry in stratospheric aerosol particles,” *Proceedings of the National Academy of Sciences*, Vol. 120, No. 43. October 24, 2023. <https://doi.org/10.1073/pnas.231337412>.
- <sup>31</sup> Congress.gov. “H.R.2262 - 114th Congress (2015-2016): U.S. Commercial Space Launch Competitiveness Act.” November 25, 2015. <https://www.congress.gov/bill/114th-congress/house-bill/2262>.
- <sup>32</sup> “Holdren letter on mission authorization,” John Holdren, Office of Science and Technology Policy, published April 4, 2016, [https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/csla\\_report\\_4-4-16\\_final.pdf](https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/csla_report_4-4-16_final.pdf).
- <sup>33</sup> Brian Weeden, “Case Study of the Interagency Process for Making Presidential Policy Decisions on Dual-Use Space Technology: The Global Positioning System and Space Traffic Management,” PhD diss., (George Washington University, 2016).
- <sup>34</sup> Executive Office of the President. “National Space Traffic Management Policy.” *Federal Register* 83, no. 120 (June 21, 2018): 28969. <https://www.federalregister.gov/documents/2018/06/21/2018-13521/national-space-traffic-management-policy>.
- <sup>35</sup> Executive Office of the President. “The National Space Policy.” *Federal Register* 85, no. 242 (December 16, 2020): 81755. <https://csp.aerospace.org/sites/default/files/2021-08/National%20Space%20Policy%209Dec20%20Fed%20Register.pdf>.
- <sup>36</sup> “White House requests proposals for regulating novel commercial space activities,” Jeff Foust, SpaceNews, published September 12, 2022, <https://spacenews.com/white-house-requests-proposals-for-regulating-novel-commercial-space-activities/>.
- <sup>37</sup> National Space Council. “Notice of In-space Authorization and Supervision Policy Listening Sessions; Request for Comments.” *Federal Register* 87, no. 199 (October 17, 2022): 62845. <https://www.federalregister.gov/documents/2022/10/17/2022-22413/notice-of-in-space-authorization-and-supervision-policy-listening-sessions-request-for-comments>.
- <sup>38</sup> Congress.gov. “H.R.6131 - 118th Congress (2023-2024): Commercial Space Act of 2023.” November 29, 2023. <https://www.congress.gov/bill/118th-congress/house-bill/6131>.
- <sup>39</sup> “Authorization and Supervision of Novel Private Sector Space Activities Act,” Executive Office of the President, published November 2023, [https://www.whitehouse.gov/wp-content/uploads/2023/11/Authorization-and-Supervision-of-Novel-Private-Sector-Space-Activities\\_Legislative-Text\\_final.pdf](https://www.whitehouse.gov/wp-content/uploads/2023/11/Authorization-and-Supervision-of-Novel-Private-Sector-Space-Activities_Legislative-Text_final.pdf).
- <sup>40</sup> “FACT SHEET: U.S. Novel Space Activities Authorization and Supervision Framework,” The White House, published December 20, 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/12/20/fact-sheet-u-s-novel-space-activities-authorization-and-supervision-framework>.
- <sup>41</sup> “Senators question White House mission authorization proposal,” Jeff Foust, SpaceNews, published December 14, 2023, <https://spacenews.com/senators-question-white-house-mission-authorization-proposal/>.
- <sup>42</sup> U.S. Congress, Select Committee on U.S. National Security and Military/Commercial Concerns with the People’s Republic of China, *U.S. National Security and Military/Commercial Concerns with the People’s Republic of China*, XX Cong., sess., 1999, Committee Print 09-006, XV-XVI.
- <sup>43</sup> *U.S. National Security and Military/Commercial Concerns with the People’s Republic of China*, XXIII.
- <sup>44</sup> “Written Testimony for Patricia A. Cooper,” Hearing on Export Controls, Arms Sales, and Reform: Balancing U.S. Interests (Part II), House Foreign Affairs Committee, February 7, 2012, <https://sia.org/wp-content/uploads/2019/12/SIA-ITAR-Written-Testimony-for-HFAC-Hearing-2012-02-07.pdf>.
- <sup>45</sup> Executive Office of the President. “Streamlining Regulations on Commercial Use of Space.” *Federal Register* 83, no. 104 (May 30, 2018): 24901. <https://www.federalregister.gov/documents/2018/05/30/2018-11769/streamlining-regulations-on-commercial-use-of-space>.
- <sup>46</sup> U.S. Library of Congress, Congressional Research Service, *The U.S. Export Control System and the Export Control Reform Act of 2018*, by Paul Kerr and Christopher Casey, R46814 (2021).
- <sup>47</sup> “U.S. government plans review of space technology export controls,” Jeff Foust, *SpaceNews*, published April 10, 2024, <https://spacenews.com/u-s-government-plans-review-of-space-technology-export-controls/>.

## About the Authors

**Dr. Brian Weeden** is a systems director for the Center for Space Policy and Strategy at The Aerospace Corporation, where he serves as a senior analyst and team leader on topics that cut across policy, technology, and economics. With more than two decades of experience in space operations and space policy analysis, Weeden specializes in the integration and advancement of technical, policy, legal, security, commercial, and international aspects of space activities. Weeden earned a bachelor's degree in electrical engineering from Clarkson University, a master's degree in space studies from the University of North Dakota, and a doctorate in public policy and administration from The George Washington University in the field of science and technology policy.

**Victoria J. Woodburn** is a communications strategic partner formerly with the Center for Space Policy and Strategy at The Aerospace Corporation. Her research focused on the relationship between public and private actors in the space enterprise. Prior to joining Aerospace, she worked for NASA Goddard Space Flight Center's Office of Communications and NASA Glenn Research Center's Space Communication and Navigation team. Woodburn holds a bachelor's degree in journalism from Northwestern University and a master's degree in international science and technology policy from The George Washington University. She is an alumna of the Space Policy Institute and recipient of the Brooke Owens Fellowship.

## About Space Agenda 2025 Publications

This paper was published as a chapter of *Space Agenda 2025*, with Angie Buckley, 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.

## About the Center for Space Policy and Strategy

The Center for Space Policy and Strategy is dedicated to shaping the future by providing nonpartisan research and strategic analysis to decisionmakers. The Center is part of The Aerospace Corporation, a nonprofit organization that advises the government on complex space enterprise and systems engineering problems.

The views expressed in this publication are solely those of the author(s), and do not necessarily reflect those of The Aerospace Corporation, its management, or its customers.

For more information, go to [www.aerospace.org/policy](http://www.aerospace.org/policy) or email [policy@aero.org](mailto:policy@aero.org).

© 2024 The Aerospace Corporation. All trademarks, service marks, and trade names contained herein are the property of their respective owners. Approved for public release; distribution unlimited. OTR202400958