

An insight report: A challenge ahead for the administration and regulation reform in the Space Industry

On June 18, President Trump signed the Space Policy Directive 3 (SPD3), the latest development in the ongoing reform of the space industry. Building on Space Policy Directive 2 (SPD2)—signed May 2018—and Space Policy Directive 1 (SPD1)—signed December 2017—SPD3 extends the National Space Council's recommendations from SPD1 and SPD2 that instructed NASA to pursue human exploration in space and set initial direction for deregulating space policy across launch, remote sensing, and export control, and outlines the Administration's intentions to develop a framework for Space Traffic Management (STM).¹

In an industry experiencing significant change, each Space Policy Directive represents another step forward for American space leadership. While the policies provide more clarity around expectations for critical roles that the Federal Aviation Administration (FAA) and the U.S. Department of Commerce (DOC) will play in the regulatory environment, a long journey still lies ahead. This journey is one that requires a structured approach to better understand the impacts of regulation reform.

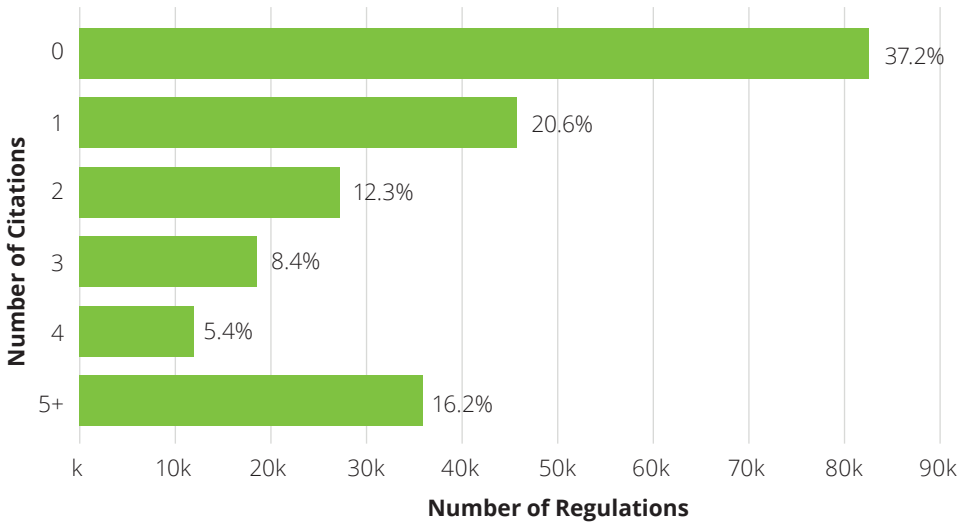
To begin to understand how space regulations could be modified to better reflect the changing needs of today's space industry, we should first look to the Code of Federal Regulations (CFR). The CFR is a document spanning 186,000+² pages of text, ~218k³ unique sections, and regulations from 183⁴ federal agencies.

While the CFR seems straightforward, where it gets complicated is when looking at regulatory dependencies, which is why we used artificial intelligence and text analytics to get a better understanding of space regulation in the CFR.

With these high-tech tools, we could see that new regulations that overwrite older “parent” regulations, regulations dependent on tangential clauses, and citations⁵ corresponding to a broader network of related regulations. Changing or removing

a single regulation isn’t enough and it doesn’t guarantee change in regulation. For example, 62 percent of regulations have at least one citation, and 16 percent have five or more. Figure 1 illustrates the citation distribution in the CFR.

Figure 1—Number of citations per regulation



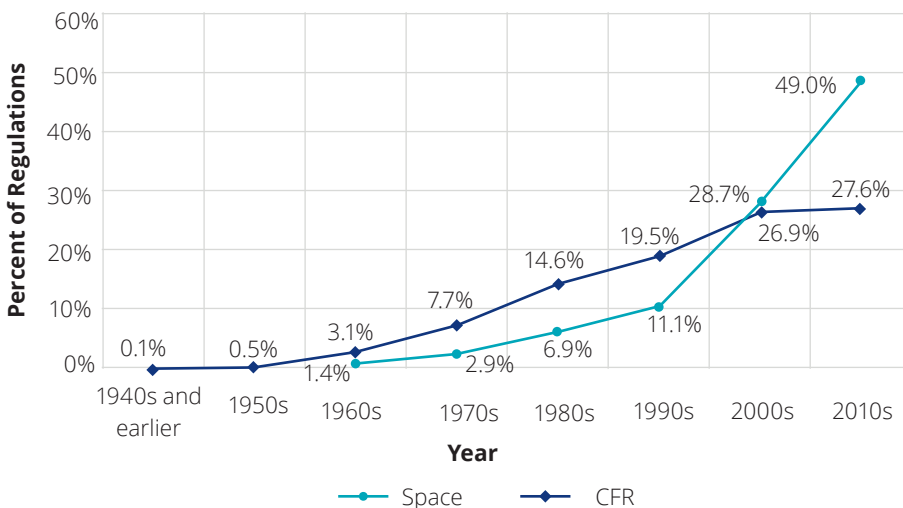
This research brings to light the 700 regulations within the CFR specifically related to space, in comparison to 217,453 non-space regulations. To ensure a thorough analysis, the regulations need to be looked at in three key ways: frequency of change, complexity, and importance.⁸

Frequency of change

In line with the change of pace seen in industry today, space regulations follow suit. Research shows 49 percent of the 700 space regulations that exist today have been

updated since 2010, in comparison to only 27 percent of all other regulations updated during that same time. Furthermore, space regulations are edited more frequently. Nearly 18 percent of space regulations have been updated 5 or more times, compared to only 3 percent of non-space regulations. In fact, a higher percentage of space regulations have been updated five or more times than the total percentage of all other regulations updated two or more times (Figure 2).

Figure 2—Space regs. updates over time, compared to overall CFR



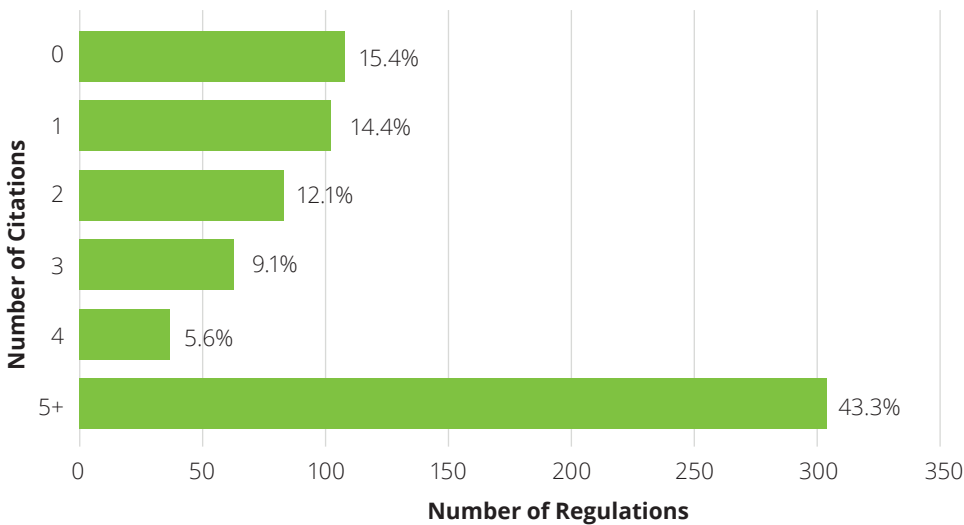
This poses a challenge that should be addressed. While these base regulations have an average time since edit of 4.94 years, their parent citations have an average time since edit of 13.52 years, providing evidence that citation conflicts for regulations dependent on one another likely exist.

Complexity

Not only are space regulations updated more frequently than non-space regulations,

but they are also significantly more complex; the average space regulation has nearly three times the amount of citations than all other regulations, with 7.2 citations versus 2.64 for non-space regulations. In addition, 85 percent of all space regulations contain at least one citation, compared to 62 percent of all other regulations. As shown in Figure 3, nearly half of space regulations have five or more citations.

Figure 3—Citations in space regulations



Each dependent citation illustrates another layer of due diligence that must be performed prior to changing any regulation. Changing just one regulation could mean affecting many others.

Importance

Space regulations are critically important, not just related to the government's ability to manage the US's space infrastructure and U.S. national security, but also for how they affect the entire network of regulations. Research shows the average space

regulation is 115 percent more important to the entire regulation network than non-space regulations. This indicates space regulations are tightly connected to other regulations. With every space regulation the government must consider at least seven other regulations, on average. But it gets more complicated, as each of those seven regulations have their own citations, which also have their own citations, and so on. The problem can increase rapidly making it nearly impossible for a person to perform manual analysis.

Analysis in action

In Figure 4, we can see a single regulation can affect dozens of other regulations that fall within the same hierarchy.

Figure 4—417.111 Parent citation hierarchy⁹



■ Original citation ■ Tier 2 related citation ■ Tier 3 related citation

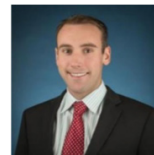
Understanding a holistic picture of the regulatory environment and considering how frequently regulations are updated, their complexity, and importance are all critical factors that must be considered during regulation reform. Agencies should consider this type of structured analysis to enable decision making, as it impacts America's ability to be nimble, decisive, and global leader in the space industry. After all, once said and done, proper regulation doesn't slow progress. It enables competitiveness.

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1. <https://www.whitehouse.gov/briefings-statements/president-donald-j-trump-reforming-modernizing-american-commercial-space-policy/>; <https://www.whitehouse.gov/briefings-statements/remarks-president-trump-meeting-national-space-council-signing-space-policy-directive-3/>
2. <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/public-sector/us-ps-using-advanced-analytics-to-drive-regulatory-reform.pdf>
3. The CFR used for this analysis was downloaded in April 2018 from the official XML copy published by the GPO.
4. Each top-level agency can be comprised of many sub agencies.
5. Citation analysis is an estimate made possible through official CFR citations. Some citations may be missed due to unofficial ways of representing another regulation.
6. All research shown was conducted by Deloitte Consulting LLP, May 2018, unless otherwise noted
7. Space regulations are defined by phrases within CFR containing the words satellites, ground station equipment, commercial satellite manufacturing, earth observation, direct-to-home tv, reusable launch vehicle (RLV), orbit, and outer space.
8. Importance, defined by PageRank, is a measure of how important a regulation is to the entire network of regulations based on inbound (parent) and outbound (child) connections/citations.
9. Network visualization made possible by [graphistry](#).

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