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Simple Steps Space Companies Can Take to Increase Transparency and Trust

Daniel Porras

Key Points

→ The emergence of in-space servicing, assembly and manufacturing (ISAM) capabilities, particularly from Western-based commercial actors, is adding to geopolitical tension among rivals in orbit.

→ Much of this mistrust is, understandably, rooted in the strong and multi-layered relationships between governments and the commercial space sector.

→ At this time, there is little guidance from international or national sources on how to ease the tension around ISAM activities, leaving open the potential for ISAM missions to create misunderstandings and, potentially, escalation.

→ Despite no official rules, private actors can adopt simple, low-cost transparency measures to ease global worries about ISAM activities and create a more sustainable space environment.

Introduction

The rise of in-space ISAM capabilities is a new source of geopolitical mistrust and strategic tension. ISAM capabilities, facilitated by advancements in robotics and automation software, include activities such as debris removal, satellite inspections and even repairs. However, these same services can also be employed for military purposes, including both defensive and offensive ones. For example, a satellite that can remove debris could also remove a functioning satellite. It is impossible to know what a particular spacecraft can do with current space-tracking technology. As such, new ISAM spacecraft create suspicion among military rivals, particularly China, Russia, the United States and other Western allies.

This mistrust is felt in particular around the activities of commercial ISAM enterprises, which can often be seen as an extension of their home governments. The intimate relationship generated through regulatory and commercial links means that governments such as the United States are creating demand for ISAM services. The character of this demand is often revealed in national policies, many of which now include commercial ISAM capabilities as part of their strategic military road maps. It does not help that, in the absence of guidance from their governments, many ISAM start-up companies are willing to explore new offensive ISAM capabilities.

About the Author

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While governments seek to address this threat at both the national and the international levels, the ISAM sector does not need to wait to reduce fears about their services. In the absence of a national or international normative framework, commercial ISAM enterprises can take the initiative and implement simple best practices and norms of behaviour to mitigate mistrust around novel operations such as debris removal or satellite servicing.

This policy brief will consider the following questions:

→ What are ISAM activities and why are they creating geopolitical mistrust?

→ What is the current legal framework around ISAM?

→ How can private actors take the initiative in reducing fears and mistrust?

Background

What Are ISAM Activities?

COSMIC (Consortium for Space Mobility and ISAM Capabilities) describes ISAM activities as a "suite of technological capabilities for use in Earth orbit, cislunar space, deep space, and on the surface of celestial bodies"[1] that can be grouped as follows:

→ servicing: includes two or more spacecraft in a rendezvous operation, including inspections and docking;

→ assembly: the construction of physical systems in space using pre-manufactured materials; and

→ manufacturing: creating objects and structures in space using raw materials.[2]

There are no limits to the applications that could emerge under each grouping. Everything from the life extension of satellites to the manufacture and assembly of a habitable space station could be included in these lists. However, the same is true of the potential of offensive capabilities, notably the ability to disrupt, degrade or even destroy strategically important satellites. The ability to

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1   See https://cosmicspace.org/about-cosmic/isam-101/.

2   Ibid.

interfere with another country's missile-warning systems or even payload-delivery capabilities would tip strategic balance among the major military space powers, and the consequences are not yet well understood. Geopolitical rivals must now account for the possible threat posed by ISAM, and there is considerable room for misinterpretation or miscalculation.

Government ISAM Activities

All of the major military space powers are developing ISAM capabilities of their own, notably China, Russia and the United States (Weeden and Samson 2024). The activities of related spacecraft are all visible to observers on Earth, although they are often cast in very different lights, depending on the point of view. For example, in 2022, China's Shijian-21 satellite towed a defunct Chinese satellite out of geo-synchronous orbit, an activity that is widely seen as responsible and even desirable for all space actors to undertake (Jones 2022). Yet the secrecy behind the mission, combined with a general sense of mistrust throughout the West,[3] made it easy for skeptics to label this capability as a threat.[4]

Likewise, China recently grouped US efforts to develop satellite life-extension capabilities with other security objectives such as deploying space-based missile interceptors (Permanent Mission of the People's Republic of China to the UN 2021). The United States also characterizes Chinese efforts to develop satellite-servicing capabilities as an indicator of designs for "space superiority" (Office of the Secretary of Defense 2023, 97–98, 103). Again, such statements are difficult to prove — especially when much of the intelligence is classified — but can be convincing to a public audience already prepared to believe the worst about geopolitical rivals.

The result is that the public perceives "their" ISAM technologies as righteous tools to promote space sustainability, while those of "others" are perceived as threats to stability and security in space. As a consequence, even benign activities involving ISAM spacecraft, such as debris removal, could be misinterpreted as having hostile intent and lead to conflict situations in space and on Earth.

Commercial ISAM Activities

Adding to the complexity of the current security environment in space is the rise of commercial ISAM actors. Companies such as Astroscale, ClearSpace and Space Logistics (headquartered, respectively, in Tokyo, Japan; Renen, Switzerland; and Falls Church, Virginia in the United States) are all working to develop and deploy sophisticated ISAM services such as debris removal, satellite life extension and even manufacturing-in-space. However, companies in this field also appear as potential proxies for their home governments and as sources for strategic advantage in space. This appearance, real or not, is largely facilitated by three major factors.

First, all the latest ISAM contracts are funded by major Western governments, making them the number-one source for ISAM funding (Astroscale 2023; Rainbow 2021, 2022). Companies looking to establish an ISAM market and become profitable must, at the very least, meet the demands of existing potential clients, which, currently, are major Western governments.

This leads to the second factor, which is that commercial ISAM actors feature prominently in many new national space defence policies. For example, the new US Department of Defense Commercial Space Integration Strategy lays out a road map to ensure access to commercial resources "across the spectrum of conflict" in space (US Department of Defense 2024). Even though the document goes to great lengths to incorporate norms and best practices established by the multilateral community, it is easy for rivals to focus on "offensive" language. This issue is by no means new, as commercial actors have featured prominently in US space strategy for securing US interests in orbit for more than a decade.[5] There are also other nations that openly discuss the prominent role that those commercial actors, in particular, ISAM companies, can play in supporting military space

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3   References in this paper to the "West" refers to states belonging to the UN Western European and Others Group, which includes Australia and New Zealand, as well as other allied countries, such as Japan and the Republic of Korea.

4   See, for example, Gertz (2021), Moriyasu (2021) and King (2023). The latter refers to bipartisan legislation introduced in the United States in March 2023 to create a commission to examine competition with China in outer space security and related technology such as ISAM: US, Bill S 863, *A bill to establish a temporary commission to develop a consensus and actionable recommendations on a comprehensive grand strategy with respect to the United States relationship with the People's Republic of China for purposes of ensuring a holistic approach toward the People's Republic of China across all Federal departments and agencies,* 118th Cong, 2023–2024, online: <www.congress.gov/bill/118th-congress/senate-bill/863?s=1&r=92>.

5   See, for example, US Department of Defense (2023, 5) regarding "leverag[ing of] commercial space services" and Gates and Clapper (2011, 4), regarding "energiz[ing] the space industrial base that supports U.S. national security."

operations.[6] It does not help that some commercial ISAM actors are candid about their willingness to develop offensive technologies that will provide a competitive edge for their national military clients.[7]

Finally, the third factor that makes companies appear as government proxies is that, in accordance with article VI of the 1967 Outer Space Treaty (OST),[8] governments must authorize and supervise the activities of their nationals, creating even greater synergies between ISAM companies and the governments that grant permits. This is especially true right now as many of the rules for ISAM are still being developed, with regulatory authorities and industry participants in deep discussion over how best to develop this sector. From a geopolitical rival's perspective, such a synergy will logically lead to companies providing cutting-edge technology in the space domain to their authorizing governments.

And yet it is not clear whether companies are even aware of the impact they are having on geopolitical relationships. While governments have agencies dedicated to studying foreign military doctrine and strategic postures, companies are focused on achieving business viability and corporate success. It is rare that large companies, let alone small start-ups, have any resources to account for geopolitical sensitivities. It is no wonder that questions are being asked about what sorts of rules need to be put in place to ensure that commercial ISAM operations will not trigger conflict in space (United Nations 2023).

Existing Rules

International Rules

The structure of outer space law is one of cascading obligations, with commercial actors residing at the bottom. International treaties and agreements create obligations on states, which must then implement those obligations through domestic laws, regulations and policies. In practice, the obligations of the 1967 OST[9] are translated into national regulations and licensing requirements for commercial actors. And while there are some fundamental rules of international space law that apply to all activities, there is by no means any official guidance on how those fundamentals should be applied to ISAM, let alone commercial ISAM. This means that fundamental concepts such as "due regard," found in article IX of the OST, apply to ISAM in general, but there is no elaboration on how it should be applied to, say, a private company trying to de-orbit a spent rocket body.

It is important to note that, under article III of the OST, international law, including the UN Charter, applies in space. There is, therefore, a prohibition on the "threat or use of force" in space, as found in article 2.4 of the UN Charter.[10] Yet there is no consensus on what constitutes the "use of force" against a satellite, or an "attack." Some governments might consider intentional jamming of a satellite to meet the threshold of an attack, while others might consider "eavesdropping" on satellite communications to be enough.

Governments hardly know where to draw the line, and companies generally look to governments for guidance on the types of capabilities they should build. In the absence of red lines set out by governments, it is inevitable that companies look to ever more innovative ways to make their ISAM business models viable, including developing technology that might be considered a weapon by rival countries. Some of these innovations, such as "guardian drones" that lurk around high-value assets, will inevitably lead to increasingly defensive postures from security rivals.

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6   See, for example, UK Ministry of Defence (2023, 7) and Pasco and Wohrer (2023).

7   See, for example, www.lockheedmartin.com/en-us/capabilities/space.html, where, at time of publication, Lockheed Martin promoted its next-generation space capabilities thus: "Back home on Earth, defending the U.S. and its allies from adversarial threats in any domain starts with space — the ultimate high ground. Lockheed Martin uses cutting-edge technologies to build capabilities that comprise layered defense systems, from missile defense to directed energy and hypersonic capabilities." See also Harris (2023).

8   *Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies*, GA Res 2222 (XXI), UNOOSA, 21st Sess, RES 2222 (1966) [*Outer Space Treaty*], online: <www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>.

9   Ibid.

10 *Charter of the United Nations*, 24 October 1945, 1 UNTS XVI, Can TS 1945 No 7, online: <www.un.org/en/about-us/un-charter/full-text>.

National Approaches

At the national level, states are still figuring out how to regulate ISAM capabilities. For example, the United States, arguably the most experienced nation in terms of its regulatory framework, is still in the early stages of defining ISAM licensing procedures,[11] and, given the political challenges currently facing Congress, it is unlikely there will be any definitive rules for the next few years (Swope 2023; Foust 2023). And while countries such as the United Kingdom are taking positive steps toward normalizing regulations for ISAM activities, they are largely focused on "safety"[12] and sustainability, not on preventing strategic misunderstandings with space rivals.

What About Norms of Behaviour?

Over the past two decades, norms of behaviour emerged as a potential first step toward a global space governance framework. The advantage of norms is that they are more flexible than treaties and could be more easily adapted as space technology continues to develop. Unfortunately, in today's political landscape, it is difficult to reach agreement on seemingly simple issues such as not intentionally creating debris in highly populated orbits. Work is ongoing, but it could be years before any guidance comes from bodies such as the United Nations.

Thus, today, there are very few guardrails, international or otherwise, that provide a clear path toward deconflicting commercial ISAM activities.

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11 See Federal Communications Commission (2024); US, Bill HR 6131, *Commercial Space Act of 2023*, 118th Cong, 2023, online: <www.congress.gov/bill/118th-congress/house-bill/6131/text>; and the section-by-section analysis by the White House in November 2023 of its proposed Authorization and Supervision of Novel Private Sector Space Activities Act, at https://bidenwhitehouse.archives.gov/wp-content/uploads/2023/11/Authorization-and-Supervision-of-Novel-Private-Sector-Space-Activities_Sectional-Analysis_final.pdf.

12 The term "safety" is used throughout this policy brief as follows: "Space safety is commonly understood to refer to measures aimed at preventing accidental or unintentional hazards to space systems" (Azcárate Ortega and Samson 2023, 39).

Corporate Initiative

While it is true that private actors do not presently have many guardrails to limit the scope of their activities, companies do not need to wait to be forced to follow norms and standards of responsible behaviour. Numerous sets of guidelines already exist to create greater confidence around commercial ISAM activities, and they would be reasonably simple to implement. Below are examples of norms that ISAM companies can, at little to no expense, incorporate into their business models to mitigate the risk of misunderstandings or miscalculations when it comes to their activities. These are built on norms found in the following documents:

→ report of the UN Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities (United Nations General Assembly 2013);

→ UN *Guidelines for the Long-term Sustainability of Outer Space Activities* (Committee on the Peaceful Uses of Outer Space 2018);

→ Space Safety Coalition (2024) best practices (version 2.39); and

→ the 2023 "Washington Compact on Norms of Behavior for Commercial Space Operations" (Committee on the Peaceful Uses of Outer Space 2023).

Before considering the norms, though, it is important to ask: why would companies incur costs, even modest ones, to address issues and challenges beyond their regulatory requirements? The answer is simply that companies will be better able to thrive economically in a space environment that is not beset by conflict. If commercial ISAM activities were, for example, labelled as a security threat by a country with anti-satellite weapon capabilities, it would be within their rights under the UN Charter to neutralize what could be seen as a threatening spacecraft, including by physical destruction. Even if this assertion were wrong from a legal perspective, the resulting environment would be much more hazardous for any business activity. As such, it is in the interests of all ISAM companies to contribute to the long-term sustainability of human space activities by acting responsibly whenever possible, even if not mandated by a regulatory body.

The following is a list of possible measures that companies can implement in their ISAM operations that can help mitigate the possibility of misunderstandings and misinterpretations at the strategic, geopolitical level.

Publication of Mission Characteristics

All of the organizations working on norms and best practices for ISAM recommend greater transparency and sharing of information. At the very least, all space actors should share the data necessary for safety of flight, but additional information can also assist in reducing security concerns around ISAM missions.

ISAM operators should publish as much data as possible about their orbital parameters in advance of a mission and do so in a way that parties around the world can understand. Data should include basic information: when will the spacecraft launch, where will it conduct its initial operations, where is it going and when. The Space Safety Coalition recommends using standard document formats offered by the Consultative Committee for Space Data Systems (CCSDS),[13] which make information easier to understand, even when the reader lives in another country.

It is also relatively easy to identify the "client"[14] and the category of service to be provided (refuelling, life extension, de-orbit and so forth). For commercial ISAM ventures, it is beneficial to discuss major contracts and operations anyway, as a way to boost confidence in the market as a whole. The more data that can be shared about a particular mission, the less room there is for suspicious conjecture, particularly from operators who will be in the vicinity of a mission. Even if politicians or news sources choose to cast a particular mission in a negative light, transparency can ease tensions among officials, as well as among the general public. To this end, it is worth publishing not only the capabilities of a particular spacecraft, but also its limitations. Companies can thus further reduce tension among military leaders and decision makers, even if the political rhetoric around a mission remains difficult.

Risk Reduction Through Direct Communication

It is also helpful for ISAM companies to issue notices to parties that might be affected by a nearby operation. For example, if a US company plans to remove a piece of debris from an orbit that neighbours, say, a Canadian weather satellite, it would be useful for the company to give notice to the Canadian authorities as early in the mission planning as possible. Ongoing communication during a mission is also vital, given that mission parameters are ever-evolving.

However, if the neighbouring satellite belongs to a country that could be considered a geopolitical rival, then companies need to work directly with their authorizing government to provide notice to the right foreign authorities. For example, if a US company wanted to remove a piece of debris and there is a Russian military satellite anywhere in the vicinity, it would be critical for the company to work with the US State Department to deconflict the operation with the Russian government well in advance of the mission. Even if the political relationship is frayed between the two governments, it puts the onus of objection on the affected party.

Establish a Point of Contact for Queries

As surprising as it may be, there is no official directory for space that provides a point of contact (PoC) for all operators. If, say, a spacecraft operated by a US company were to come into close range of a Chinese satellite, it is very likely that neither operator would know whom to call to coordinate collision avoidance manoeuvres. Likewise, if a commercial US ISAM spacecraft were to come "close" to a Chinese spacecraft, it is unlikely either party would know whom to contact to give or receive credible information about the mission. By creating an official PoC, ISAM companies can provide a viable path toward two-way communication regarding safety and mission information. This PoC can be a designated repository for information such as orbital parameters, details about the client and at least general characteristics of the mission. While all this information must be weighed against intellectual property rights, export control regulations and even security requirements, some data is better than none at all.

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13 See "Mission Operations and Information Management Services Area" on the CCSDS website: https://public.ccsds.org/Publications/MOIMS.aspx.

14 As defined by the CONFERS (Consortium for Execution of Rendezvous and Servicing Operations) Lexicon: https://satelliteconfers.org/confers-lexicon/.

Adopt Standard Manoeuvre Criteria

Another way to provide assurances to third parties about commercial ISAM activities is to avoid unannounced manoeuvres as much as possible. While some space data organizations, such as Space-Track.org, allow for and encourage the listings of manoeuvres, there is no legal requirement to disclose to the general public or affected operators. Thus a great deal of anxiety can result if a spacecraft with unknown capabilities suddenly changes its trajectory.

Once a company announces its mission parameters, it should try to keep to them as much as possible so as to create predictability. Doing so will help reduce fears of "rogue missions" or "pirates" in orbit. Moreover, companies can adopt standard manoeuvre criteria for those instances when it is necessary to move, such as those provided in number eight of the Space Safety Coalition's best practices, "Rules of the Road (RotR) and Maneuver Prioritization" (Space Safety Coalition 2024, 15). These criteria can constrain suspicious behaviour that could be misinterpreted by a geopolitical rival.

Encode Identifier into the Telemetry Beacon

Finally, companies can ensure that their spacecraft are visible and trackable to all, by making sure that their telemetry beacons are working properly. The beacons will enable the public to track and observe their activities, facilitating safety of flight requirements as well as reducing security risks. Most satellites already have tracking beacons, as they are critical for telemetry purposes, but companies can go further by inserting into the beacon plain text that clearly identifies the spacecraft. Clear identification will ensure that third parties — particularly geopolitical rivals — do not mistake a commercial spacecraft for a potential threat.

Conclusion

As commercial ISAM companies establish themselves as viable players in the orbital environment, they run the risk of having a negative impact on space security. The dual-purpose nature of ISAM technology is such that it is difficult to know what ISAM spacecraft are capable of, and geopolitical rivals regard ISAM as yet another threat. Unfortunately, there are few rules, at either the international or the national level, that create any guardrails to mitigate the risk of misinterpretation or miscalculation around commercial ISAM activities, and few companies are equipped to manage geopolitical sensitivities.

However, these same companies can take proactive steps in the absence of guidance from governments or the international community. These measures can include:

→ publication of mission characteristics;

→ risk reduction through direct communication;

→ establishing a PoC for queries;

→ adopting standard manoeuvre criteria; and

→ encoding identifiers into telemetry beacons.

These examples, based on recommendations from existing norms and best practices, are relatively inexpensive and can help mitigate threats to space security for all. In this way, companies will also ensure the economic viability of low-Earth orbit for their own business survival.

Acknowledgements

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