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GOVERNING ORBITAL SPACE

The Regulatory and Geopolitical Landscape of the Debris Crisis

A policy and strategic intelligence assessment for governments, defence ministries, and institutions navigating the international governance of Earth's orbital environment.

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Executive Summary

Orbital debris governance is one of the most structurally fragmented regulatory domains in international affairs. There is no binding international instrument that prohibits debris-generating activities, mandates disposal compliance, or establishes liability enforcement adequate to the scale of the problem. This paper maps the full governance architecture — its institutions, legal instruments, national frameworks, geopolitical fault lines, and strategic implications — for governments and institutions that need to understand the landscape they are operating in.

The regulatory framework governing orbital debris is a layered architecture of voluntary guidelines, soft-law instruments, and national licensing requirements. The Inter-Agency Space Debris Coordination Committee guidelines, the UN COPUOS Long-Term Sustainability Guidelines, and the national rules issued by the FCC and ESA each represent genuine progress. But they operate in a system where compliance is uneven, enforcement is national rather than international, and the actors responsible for the largest historical fragmentation events are not meaningfully accountable under existing law.

The geopolitical dimension is inseparable from the regulatory one. Major space powers have strategic interests in the orbital environment that routinely compete with sustainability objectives. The same nations that advocate for binding debris standards in international forums have conducted debris-generating Anti-Satellite tests. The dual-use nature of Active Debris Removal technology — the most promising technical solution to the debris problem — makes it simultaneously a strategic military capability, creating a structural barrier to the international cooperation that orbital sustainability requires.

For governments, defence ministries, and institutions with a stake in orbital infrastructure, this paper provides the intelligence needed to navigate the governance landscape: what standards exist, where compliance breaks down, how geopolitical interests shape regulatory outcomes, and where the trajectory is heading.

1. The International Regulatory Architecture

The Treaty Foundation — Built for a Different Era

The foundational legal framework governing space operations was established through five international treaties negotiated between 1967 and 1979. These instruments created the basic legal architecture for space activity but were drafted before orbital debris was recognised as a systemic risk, before commercial spaceflight existed at scale, and before the megaconstellation era changed the operational character of the orbital environment entirely.

The Outer Space Treaty of 1967 — the cornerstone of space law — establishes that space is the province of all mankind, prohibits weapons of mass destruction in orbit, and assigns states responsibility for their national space activities. It does not prohibit kinetic Anti-Satellite testing. It does not mandate disposal. It does not address the debris commons problem at all. The Liability Convention of 1972 provides a claims mechanism for damage caused by space objects but under a fault-based standard for space-to-space damage that is practically unworkable for debris claims spanning years or decades (the exact friction points between historical UN treaties and modern operational risks are visually cross-referenced in Figure 1).

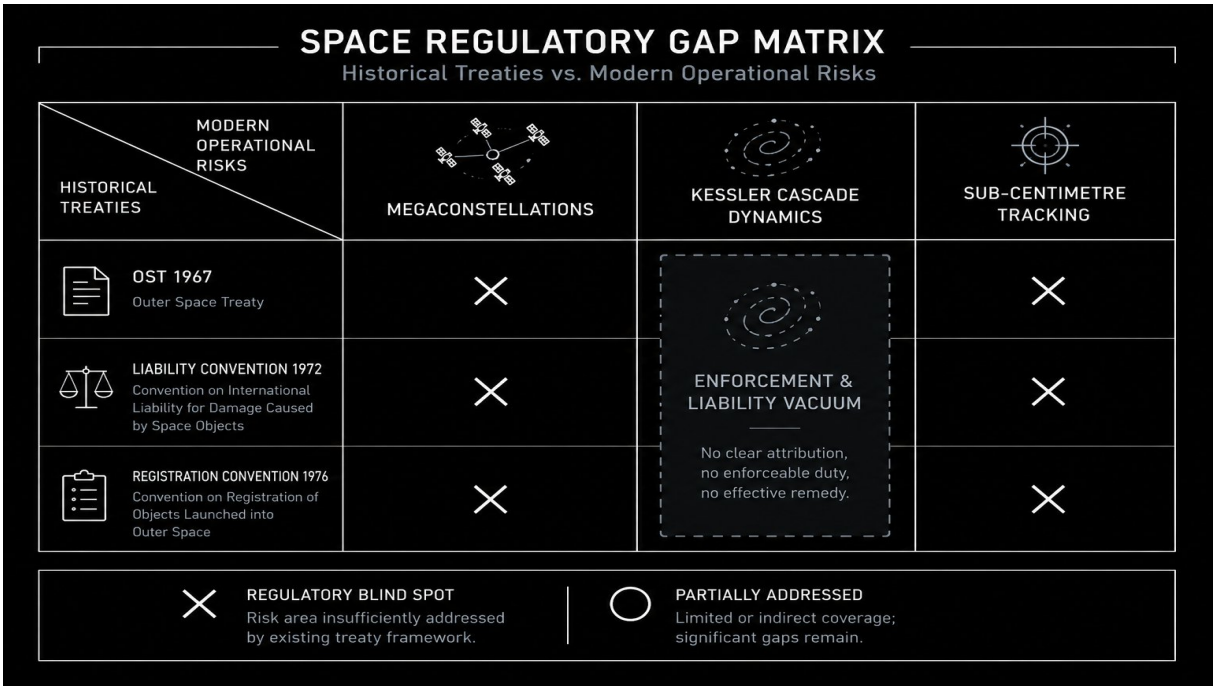

Figure 1: The International Legal Gap Matrix: Intersecting UN space treaties against modern orbital risks, highlighting the systemic regulatory vacuum for space-to-space collision liability and debris tracking.

> *The foundational space treaties created a legal framework adequate for the bilateral US-Soviet space competition of the 1960s. They were not designed for — and do not address — the reality of 2026: thousands of active satellites, tens of thousands of debris objects, megaconstellation operators launching hundreds of satellites per year, and nation-states conducting debris-generating tests as instruments of geopolitical signalling.*

The Soft-Law Layer — Where Governance Actually Operates

In the absence of binding treaty obligations on debris mitigation, the effective governance layer is soft law: voluntary guidelines developed through international technical cooperation and adopted through national regulatory frameworks. The IADC Space Debris Mitigation Guidelines, first published in 2002 and updated in 2025, represent the primary technical consensus standard. The UN COPUOS Long-Term Sustainability Guidelines, adopted in 2019 after seven years of negotiation, represent the broadest international political consensus. Neither instrument is legally binding.

The significance of the LTS Guidelines negotiation lies not in the commitments it produced — it produced none that are enforceable — but in the geopolitical dynamics it revealed. China and Russia consistently opposed provisions that would have created accountability mechanisms or defined responsibilities for historical debris contributions. The final text reflects the consensus that was politically achievable, not the standard the environment requires. This is the core limitation of soft-law governance: it can only reach the level of consensus among actors with competing interests, not the level of ambition that the problem demands.

2. National Regulatory Frameworks — The Enforcement Reality

The practical enforcement of orbital debris standards operates through national licensing frameworks. Operators require spectrum licences and, in some jurisdictions, mission authorisations from national authorities before they can launch. These licensing processes are the primary mechanism through which international guidelines become operational requirements.

Jurisdiction	Standard	Enforcement Mechanism	Compliance Assessment
United States (FCC)	5-year LEO disposal rule (2024); collision avoidance plan required; orbital debris mitigation plan mandatory	Spectrum licence denial or non-renewal for non-compliant operators; applies to non-US operators serving US market	Most rigorous framework globally; spectrum leverage creates effective commercial enforcement
European Union / ESA	ESA Space Debris Mitigation Guidelines 2024 (technical); EU Space Law (anticipated 2026, binding supranational)	ESA guidelines currently voluntary; EU Space Law will create binding mandatory standard across all EU member states	ESA technically advanced; EU Space Law will represent first binding supranational debris standard
Japan	National Space Activities Act; JAXA guidelines aligned with IADC	Ministry of Land, Infrastructure, Transport and Tourism licensing; JAXA mission approval	Strong national framework; Japan's CRD2 national debris removal programme demonstrates institutional commitment
China	National Outer Space Law (2024); national standards exist	National space authority licensing — enforcement opacity limits external assessment	2007 Fengyun-1C ASAT test and 2024 Long March 6A breakup raise compliance credibility questions
Russia	National space legislation; Roscosmos licensing	State space corporation oversight	2021 Kosmos 1408 ASAT test demonstrates strategic non-compliance with no-fragmentation norms
Emerging operators	Variable — many jurisdictions lack national space law frameworks	Weak to absent enforcement in licensing jurisdictions	Highest compliance risk; fastest-growing segment of the satellite operator population

The most significant structural weakness of the current enforcement architecture is what it cannot reach. The FCC five-year disposal rule, for all its rigour, applies to operators requiring FCC spectrum licensing — primarily operators serving the US market. An operator launching satellites

under the jurisdiction of a nation with minimal national space law faces no equivalent enforcement mechanism. The governance gap is precisely where non-compliance is most likely.

3. The Geopolitical Fault Lines

Three Blocs, Three Sets of Interests

International debates on orbital debris governance consistently reveal a three-bloc structure. Understanding the interests and positions of each bloc is prerequisite intelligence for any institution engaged in space policy, orbital infrastructure planning, or sovereign space programme development (the strategic friction and competing infrastructure priorities between these three primary global governance coalitions are mapped in Figure 2).

Bloc	Core Members	Governance Position	Underlying Interest
Western Standards Bloc	United States, European Union, United Kingdom, Japan, Australia, Canada	Advocates binding disposal standards, ASAT test moratorium, Space Traffic Management framework. Positions itself as the responsible governance bloc.	Preservation of existing orbital advantages; use of high standards as competitive barrier; protection of commercial megaconstellation investments; legitimisation of existing military space posture
Counter-Hegemony Bloc	China, Russia	Advocates PAROS (Prevention of Arms Race in Outer Space) as alternative framework. Opposes binding disposal standards that would constrain future capability development.	Preservation of ASAT capability for strategic leverage; resistance to standards that institutionalise Western orbital dominance; development of counterspace capabilities as deterrence
Emerging Space Nations	India, UAE, Saudi Arabia, Brazil, South Korea, and 50+ growing operators	Positions vary; generally seek operational flexibility while accessing spectrum and orbital slots; increasingly aligned with Western standards due to funding and technology dependencies	Access to spectrum, orbital slots, and technology transfer; avoiding entry barriers imposed by standards developed by incumbents; building sovereign space capability

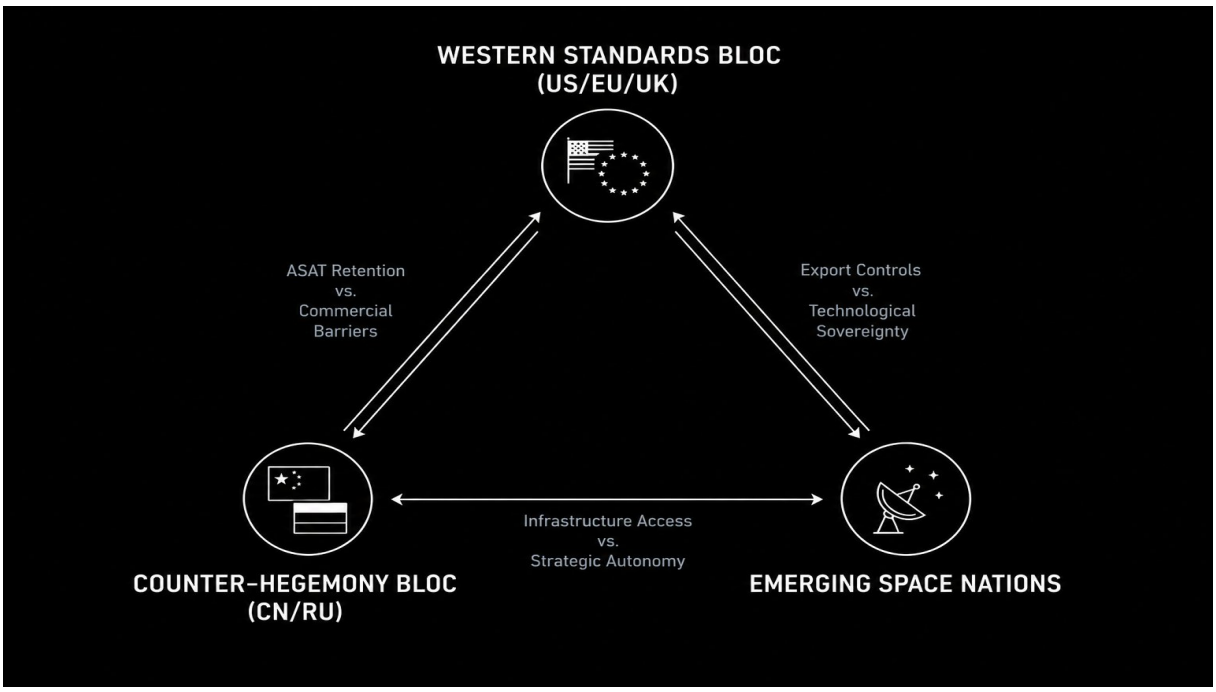

Figure 2: The Geopolitical Fault Lines of Orbital Space: Strategic friction and competing space infrastructure priorities between the three primary global governance blocs.

The ASAT Problem — When Fragmentation Is a Policy Tool

The most consequential dimension of orbital debris geopolitics is one that purely technical analyses consistently understate: the deliberate use of debris-generating Anti-Satellite weapon tests as instruments of strategic demonstration. The majority of the most catastrophic fragmentation events in the historical record were not accidents — they were nation-states conducting kinetic ASAT tests, accepting the debris consequences as the cost of geopolitical signalling.

As of 2025, four nations have conducted debris-generating kinetic ASAT tests: the United States, China, Russia, and India. The Secure World Foundation's 2025 Global Counterspace Capabilities Report documents active counterspace technology development across 13 countries. The consequences of these tests — debris clouds persisting for decades at operational altitudes — fall on every orbital operator globally, regardless of their relationship to the testing nation. The 2025 Shenzhou-20 debris strike, caused by China's own 2007 Fengyun-1C fragments, illustrated with unusual clarity that orbital debris does not recognise national boundaries.

> *Anti-Satellite weapon tests are debris events by design. When a nation destroys a satellite at operational altitude, the fragments it generates threaten every satellite at that altitude — allied, adversarial, neutral, and civilian — for a decade or more. Orbital debris is a weapon with no targeting system. Its effects are permanent and indiscriminate.*

The Dual-Use Impasse

The most structurally intractable governance problem in the orbital debris domain is the dual-use nature of Active Debris Removal technology. A spacecraft capable of rendezvous, proximity

operations, and capture of a defunct satellite is technically identical to a spacecraft capable of approaching and disabling an active satellite. The distinction is entirely operational intent — the hardware is the same. China and Russia have consistently framed Western ADR development as dual-use military capability in international forums, using this framing to resist ADR regulatory frameworks that would otherwise advance orbital sustainability.

This creates a genuine dilemma for the governance architecture. The technology the orbital environment most needs — reliable, scalable ADR — is the technology that the geopolitical structure makes hardest to govern internationally. Progress on ADR governance will require either bilateral agreements that build trust between blocs, or a neutral institutional framework that neither bloc perceives as serving the other's military interests.

4. The Regulatory Trajectory — Where This Is Heading

Tightening Standards and the Compliance Curve

The direction of travel in orbital debris regulation is unambiguous. The 25-year post-mission disposal guideline that governed the industry for two decades has been replaced by five-year mandatory rules in the two largest regulatory jurisdictions. The EU Space Law will introduce the first binding supranational standard. The ORBITS Act, if enacted in the United States, will establish ADR compatibility requirements. The regulatory floor is rising — and it will continue to rise.

For institutions designing orbital infrastructure today, the relevant planning horizon is not current requirements — it is the requirements that will exist in 2030 and 2035. Operators who design ahead of the regulatory trajectory—building disposal capability, ADR-compatible interfaces, and Space Traffic Management participation into their architecture before it is required—avoid the cost and disruption of retroactive compliance (the evolutionary shift from legacy 25-year rules to integrated spectrum-debris enforcement milestones is outlined chronologically in Figure 3).

Regulatory Development	Timeline	Significance
FCC 5-Year LEO Disposal Rule	In force — 2024	Global benchmark; applies beyond US operators through spectrum licensing leverage
ESA Space Debris Mitigation Guidelines 2024	In force — 2024	Most technically rigorous voluntary standard; increasingly adopted as national baseline
EU Space Law	Anticipated 2025/2026	First binding supranational debris standard; will affect all operators accessing EU markets or registered in EU jurisdictions
IADC Guidelines Update 2025	Published — 2025	Aligns international technical consensus with 5-year disposal standard; replaces 25-year legacy rule
US ORBITS Act (S.1898, 2025)	Proposed — monitoring	First legislative framework addressing ADR requirements and satellite operator ADR-compatibility obligations
International STM Framework	Negotiation ongoing	Long-term governance development; binding Space Traffic Management rules remain the unresolved governance frontier

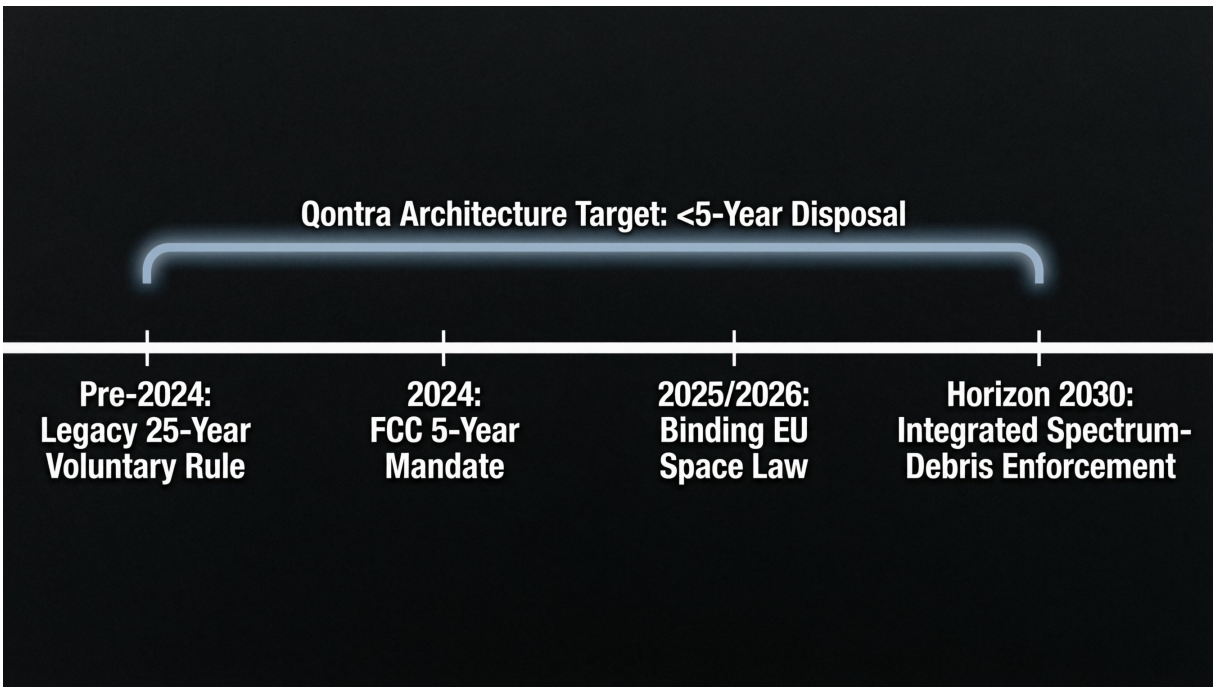

Figure 3: Regulatory Trajectory to 2030: The evolutionary shift from legacy 25-year voluntary guidelines to binding supranational mandates and integrated spectrum-debris enforcement.

The Neutral Infrastructure Opportunity

The three-bloc structure of orbital governance creates a specific strategic opening for neutral orbital infrastructure that neither bloc perceives as serving the other's military or commercial interests. Both the Western Standards Bloc and the Counter-Hegemony Bloc require access to independent orbital intelligence — about environmental conditions, other operators' activities, and emerging events. Neither bloc can access the other's national intelligence assets. An infrastructure that is demonstrably neutral — by ownership structure, operational doctrine, and institutional design — occupies a unique position in this landscape.

Institutional actors — governments, multilateral agencies, defence ministries, and sovereign wealth funds — that are navigating the governance landscape described in this paper require intelligence partners whose neutrality is credible, whose technical standards are demonstrably rigorous, and whose orbital sustainability commitments go beyond minimum compliance. The alignment between those requirements and the standards of responsible orbital infrastructure operation is not coincidental. It is the architecture of the opportunity.

5. Five Intelligence Conclusions for Institutional Decision-Makers

- The regulatory framework is structurally insufficient for the problem it faces. Voluntary guidelines, national licensing enforcement, and soft-law instruments cannot compel compliance by the actors most likely to generate future debris. Binding international obligations that do not yet exist will be necessary for long-term orbital sustainability.
- Geopolitical competition is an active driver of debris generation, not merely an obstacle to governance. ASAT testing as strategic demonstration has created the largest debris events in history. Any institutional assessment of orbital risk must include deliberate fragmentation as a scenario, not merely accidental collisions.
- The regulatory trajectory is clearly upward. Institutions designing orbital infrastructure today should plan for 2030 and 2035 requirements, not 2024 minimums. The cost of retroactive compliance redesign significantly exceeds the cost of forward-looking design.
- Neutral orbital infrastructure has unique governance value. In a three-bloc geopolitical landscape where the major space powers cannot share intelligence with each other, genuinely neutral orbital infrastructure — credibly non-aligned by ownership, doctrine, and design — occupies a position of structural access that neither bloc can replicate from within its own assets.
- The governance vacuum around Active Debris Removal is the most consequential unresolved question in space policy. Who has legal authority to approach and capture a defunct satellite registered to another state? The answer does not yet exist in international law. The institutions that shape the answer will shape the commercial and strategic architecture of orbital sustainability for the next generation.

About Qontra

Qontra is a deep technology company building planetary-scale orbital intelligence infrastructure across all 195 countries. Qontra's Policy and Institutional Research Unit conducts research on space law, intelligence sovereignty, data governance, and the political economy of neutral observation infrastructure. Qontra's orbital sustainability architecture — designed ahead of anticipated regulatory requirements, operationally committed to the No-Fragmentation Doctrine, and structured as a genuinely neutral global platform — reflects the convergence of rigorous research and strategic institutional design.

For partnership enquiries, sovereign programme engagements, or institutional research collaboration, contact Qontra through official channels.