

# **Militarising the Final Frontier: Space Dominance and Anti-Satellite Weapons**

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## **Militarising the Final Frontier: Space Dominance and the Rise of Anti-Satellite Weapons by Magadev Adam Kuha Kumaran**

Outer space has undergone a profound transformation from a domain associated primarily with scientific exploration and international cooperation into a contested strategic arena. Contemporary military operations, global communications, navigation, intelligence collection and economic activity now depend heavily on space-based assets, rendering space integral to national power. As reliance on satellites has deepened, so too has concern over their vulnerability, particularly through the development and testing of anti-satellite (ASAT) weapons.

ASAT capabilities are designed to disrupt, disable or destroy satellites through electronic or cyber means. While often framed as defensive measures, ASAT tests generate long-lasting orbital debris and have become one of the most visible drivers of space militarisation. This policy brief examines how orbital congestion and ASAT testing have accelerated the transformation of space into a militarised domain, heightening strategic competition and risks of escalation among major powers.

The paper proceeds in six stages. First, it defines space dominance and explains why states seek military advantage in space. Second, it situates ASAT development within the historical evolution of space power from the Cold War to the present. Third, it analyses Russia's 2021 ASAT test and India's 2019 Mission Shakti as illustrative cases of contemporary counterspace behaviour. Fourth, it evaluates current governance mechanisms and frameworks. Fifth, it gives an outlook over the future of space militarisation. Finally, it develops policy recommendations to address the challenges posed by ASAT proliferation and space militarisation.

### **Space Dominance and Strategic Competition**

#### ***Defining Space Dominance***

Space dominance refers to a state's ability to secure access to and use of space-based capabilities for its own purposes while denying or degrading an adversary's ability to do the same. Bowen defines space control as the capacity to "secure the use of space for one's own forces and deny it to an adversary," emphasising the strategic value of satellites for communications, navigation, intelligence, surveillance and reconnaissance (ISR, Bowen, 2021). In modern warfare, space dominance does not necessarily imply

weaponising space platforms themselves, but rather controlling the information and services that flow through orbital infrastructure.

### ***Why Space Matters***

States compete in space for three imperative interrelated reasons: military effectiveness, political advantage and economic edge. Militarily, space-based systems provide real-time intelligence, precision navigation and secure communications that shape outcomes on the battlefield (Akhmetov et al., 2019). The loss or degradation of these assets could severely undermine a state's ability to conduct military operations. Politically, achievements in space serve as symbols of technological superiority and national prestige. Successful launches, lunar missions or demonstrated counterspace capabilities can bolster domestic legitimacy and project international influence, particularly for emerging powers such as China and India (The Diplomat, 2019). Economically, satellites underpin global finance, logistics, weather forecasting and telecommunications. Control over orbital slots and satellite constellations can therefore translate into long-term commercial and geopolitical advantages. The rapid expansion of private space actors has further blurred the boundary between civilian and military systems, complicating efforts to preserve space as a purely peaceful domain (Thiele & Boley, 2021).

### ***Strategic Risks and Consequences***

The militarisation of space carries significant risks. ASAT tests generate orbital debris that can persist for decades, threatening both civilian and military satellites (U.S. Space Command, 2021). Moreover, interference with satellites may be misinterpreted as a hostile act, increasing the risk of escalation during crises. As satellites increasingly become legitimate military targets, space is emerging as a critical vulnerability rather than a sanctuary.

## **From Scientific Exploration to Counterspace Capabilities**

### ***Cold War Origins and Dual-Use Technology***

The foundations of space militarisation lie in the dual-use nature of early rocketry. Technologies developed for scientific exploration were closely intertwined with military missile programmes. This dynamic was evident in the post WWII transfer of German V-2 rocket expertise to the United States under Operation Paperclip, which accelerated both ballistic missile development and space launch capabilities (Cambridge University Press, 2021).

The Cold War rivalry between the United States and the Soviet Union further entrenched the strategic value of space. The launch of Sputnik 1 in 1957 demonstrated the feasibility of intercontinental missile technology, intensifying security fears and fuelling the space race (Bowen, 2021). Although the 1967 Outer Space Treaty prohibited the placement of nuclear weapons in orbit and declared space the ‘province of all mankind’ it left ASAT weapons largely unregulated, reflecting the treaty’s primary focus on preventing nuclear escalation rather than conventional counterspace conflict.

### ***Post–Cold War Expansion of ASAT Capabilities***

The 1991 Gulf War marked a turning point by demonstrating the decisive role of space-based systems in conventional warfare. GPS, satellite communications and ISR assets were central to coalition success, revealing both their strategic importance and their vulnerability (Bowen, 2021). As reliance on these systems grew, incentives to develop means of disabling adversary satellites intensified. Following the collapse of the Soviet Union, the erosion of the bipolar space race coincided with the emergence of new space actors. China’s 2007 ASAT test, which generated extensive debris, underscored the growing salience of counterspace capabilities and set a precedent later followed by India and Russia (Thiele & Boley, 2021).

### **Cases of Recent ASAT Testing**

#### ***Russia’s 2021 ASAT Test***

In November 2021, Russia conducted an ASAT test against its defunct COSMOS-1408 satellite. The test produced more than 1,500 trackable pieces of debris, forcing astronauts aboard the International Space Station to take emergency shelter (U.S. Space Command, 2021). The incident drew widespread condemnation from the United States, NATO, the European Union and Japan, who characterised the test as reckless and destabilising. Strategically, the test signalled Russia’s continued investment in counterspace capabilities amid deteriorating relations with the West following the annexation of Crimea. U.S. Space Command warned that the action demonstrated “a deliberate disregard for the security, safety, stability, and long-term sustainability of the space domain” (U.S. Space Command, 2021). Although Russia faced no formal sanctions for the test, the incident renewed international momentum towards limiting debris-generating ASAT activities.

#### ***India’s 2019 Mission Shakti***

India's Mission Shakti ASAT test in March 2019 marked its entry into the small group of states with demonstrated counterspace capabilities. The test destroyed the Microsat-R satellite and generated approximately 400 pieces of debris (NASA; Indian Express, 2019). Indian officials framed the test as a deterrent measure and emphasised its low-altitude design to minimise long-term debris risks. The timing of Mission Shakti, shortly after the Pulwama terrorist attack and amid heightened tensions with Pakistan, gave the test a strong signaling dimension, and Pakistan condemned the action and raised concerns at the United Nations Conference on Disarmament. At the same time, the test underscored India's strategic competition with China and its aspiration to be recognised as a major space power (Akhmetov et al., 2019).

### **Governance and Arms Control Frameworks for ASATs**

Despite the clear strategic and environmental risks posed by ASAT testing, international governance mechanisms remain limited. The 1967 Outer Space Treaty prohibits nuclear weapons in orbit but does not explicitly regulate conventional ASAT weapons, leaving a significant loophole (Bowen, 2021). Subsequent agreements, such as the 2001 UN Guidelines for the Long-term Sustainability of Outer Space Activities, provide non-binding principles but lack enforcement measures (UNOOSA, 2001). Several proposals have emerged to address this gap: establishing a legally binding ban on ASAT tests (Arms Control Association, 2021), developing verification and monitoring mechanisms through the UN Committee on the Peaceful Uses of Outer Space (COPUOS) (UNOOSA, 2001), and creating multilateral frameworks for transparency and boosting international confidence among nations with space programs (Thiele & Boley, 2021). Effective governance must also integrate commercial and private actors, whose satellite constellations and services now play direct military and strategic roles, to prevent the militarisation of civilian infrastructure (NASA; Indian Express, 2019).

### **Policy Recommendations for Space Security**

Based on historical experience, strategic analysis, and cases of ASAT tests, the following policy recommendations aim to reduce the risks of space militarisation while promoting long-term sustainability and stability:

1. **Ban on Debris-Generating ASAT Tests:** States should agree to a legally binding moratorium on ASAT tests that produce long-lived debris (UNOOSA, 2001). Such a measure would directly reduce risks to operational satellites and human spaceflight.

2. **Tiered Regulatory Framework:** States could adopt a realistic two-tier system: Tier 1 prohibiting destructive counterspace capabilities targeting civilian satellites, and Tier 2 regulating permissible counterspace activities, including electronic and cyber methods, under strict transparency and reporting requirements (UNOOSA, 2001; Thiele & Boley, 2021).
3. **Enhanced Transparency and Confidence-Building Measures:** Regular notifications of planned satellite launches, manoeuvres, and counterspace activities should be standard (UNOOSA, 2001). Multilateral exercises and data-sharing agreements can reduce misperceptions and lower the risk of escalation (Bowen, 2021).
4. **Integration of Commercial Actors:** Private satellite operators must be incorporated into space governance frameworks. The involvement of private actors raises the economic and political costs of militarisation, such as Elon Musk's Starlink, to such an extent that states are deterred from escalating conflict in space. (NASA; Indian Express, 2019).
5. **Strengthening International Legal Frameworks:** Building upon the Outer Space Treaty and UN guidelines, a dedicated international treaty addressing ASATs and counterspace operations should be developed (UNOOSA, 2001). This treaty should define prohibited behaviours, establish verification mechanisms, and provide dispute-resolution processes (Arms Control Association, 2021).
6. **Research and Development for Debris Mitigation:** Investment in technologies to remove or neutralise orbital debris and protect critical satellites should be prioritised (Thiele & Boley, 2021). States should collaborate on developing and standardising these technologies to ensure safety and sustainability (UNOOSA, 2001).

### **The Future of Space Militarisation**

Looking ahead, the future of space militarisation is likely to be characterised less by overt weapon deployment in orbit and more by intensified competition over counterspace capabilities, resilience, and control of orbital infrastructure. As states become increasingly dependent on satellites for military command, economic activity and political signalling, incentives to develop non-combatative ASAT tools such as cyber interference, electronic warfare and co-orbital systems are likely to grow, given the costs outweigh the benefits. For space nations orbital debris can lead to unwanted international pressures on earth. Non-destructive ASAT's can still achieve space dominance without the political as well as economic costs considering orbital debris can damage the nations' own space technology. At the same time, the expansion of commercial satellite constellations will further blur the line between civilian and military assets, increasing the risk that private infrastructure becomes entangled in strategic competition. Without stronger international norms and binding restrictions on destructive counterspace behaviour,

space is likely to evolve into a domain of persistent strategic instability, where signalling, deterrence and escalation management resemble early Cold War dynamics. The trajectory of space militarisation will therefore depend not only on technological developments, but on whether major powers can translate growing awareness of orbital damage into meaningful arms control and cooperative governance mechanisms.

## **Conclusion**

Space can no longer be understood as a purely scientific or cooperative domain. The growing reliance on satellites for military, political and economic purposes has transformed outer space into a critical arena of strategic competition. ASAT testing by Russia and India demonstrates how counterspace capabilities are increasingly used to signal power and deter adversaries, while simultaneously generating systemic risks that extend far beyond national interests. Without effective international regulation, debris-generating ASAT activities threaten the long-term sustainability of the space environment and increase the likelihood that incidents in orbit could escalate into conflict. Addressing these challenges will require renewed commitment to arms control, clearer norms governing counterspace behaviour, and greater integration of emerging commercial actors into space security frameworks.

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