

**NON-PAPER**  
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**“Implications of Mega-Constellations in Outer Space  
for International Security”**

*In the Name of God, the Most Compassionate, the Most Merciful*

**1. Introduction**

The advent of proliferated satellite constellations, commonly referred to as mega-constellations, represents a significant transformation in the modern era of outer space activities. This revolutionary development has been enabled by the convergence of several key technologies, including mass production of low-cost satellites, miniaturization of satellite systems, multiple and reusable launch capabilities, inter-satellite networking, portable ground terminals, and automated fleet management powered by artificial intelligence.

Mega-constellations are characterized by distinctive features such as high resiliency, global coverage, low latency, broadband communication, reduced dependence on ground infrastructure, rapid deployability, and applicability across air, maritime, and terrestrial domains. These advantages, while beneficial for commercial purposes, also make such systems highly attractive for military applications and armed forces.

Although initially presented as transformative innovations with universal benefits, the deployment and operation of mega-constellations have given rise to a wide range of legal, technical, environmental, and security concerns that warrant the urgent attention of the international community. In many respects, mega-constellations have generated “mega-challenges.”

While some of these challenges are being discussed within the framework of the Committee on the Peaceful Uses of Outer Space (COPUOS) and its

Working Group on the Long-Term Sustainability (LTS) of Outer Space Activities, significant gaps remain unaddressed.

## **2. Legal and Environmental Implications**

The increasing occupation of low Earth orbit (LEO) by mega-constellations risks contravening key principles enshrined in the Outer Space Treaty (OST), which designates outer space as the province of all humankind and guarantees free and equitable access for all States. The rapid and extensive deployment of thousands of satellites in lower orbits could lead to orbital saturation, effectively restricting other States' access to orbital resources. Such practices may amount to de facto appropriation of outer space, contrary to Article II of the OST.

Furthermore, the current "first-come, first-served" approach to spectrum and orbital slot allocation risks precipitating a "tragedy of the commons," whereby a small number of States or private operators monopolize limited orbital and frequency resources to the detriment of others.

Environmental impacts, including an elevated risk of collisions and the proliferation of space debris, present additional long-term sustainability challenges. The global community of professional astronomers has also raised serious concerns about light pollution and radio interference, which hinder scientific observation and research and have transformed dark and quiet skies into bright and noisy ones.

## **3. Security and political Implications**

The increasing militarization of commercial mega-constellations poses a grave threat to international peace and security. The use of commercial satellite constellations to support military operations demonstrates the erosion of the traditional distinction between civilian and military space assets.

For instance, during the unlawful aggression of the Israeli regime against the territory of the Islamic Republic of Iran in June 2025, a significant portion of offensive weapon systems, including unmanned aerial vehicles, fighter jets, bombers, early-warning and intelligence platforms, were supported by satellite-based communications and internet services, particularly those provided by the Starlink constellation. These systems were used to conduct precision attacks against civilians and critical civilian infrastructure,

amounting to war crimes. This case underscores the direct involvement of commercial mega-constellations in military operations.

It is now evident that the capabilities of mega-constellations are increasingly integrated into C5ISR systems, encompassing command, control, communications, computers, combat systems, intelligence, surveillance, reconnaissance, and targeting, across contemporary battlefields. This integration demonstrates how such constellations have become essential enablers of network-centric warfare and multidomain military operations.

The deliberate use of dual-use or commercially-operated satellites to support military operations brings the international community dangerously close to a situation, where outer space becomes a direct domain of conflict.

If not urgently addressed, the continued militarization and weaponization of mega-constellations could trigger a new arms race in outer space, undermine global security, and jeopardize the peaceful exploration and use of outer space for all humankind.

#### **4. Violations of Sovereignty and Unauthorized Services**

Under ITU regulations, satellite operators are prohibited from providing broadcasting or communication services within the territory of any State without authorization. However, the SpaceX company, owner of the Starlink constellation, has repeatedly provided unauthorized services within the territory of the Islamic Republic of Iran and has publicly acknowledged this on social media.

The Government of the Islamic Republic of Iran formally submitted a complaint to the Radio Regulations Board (RRB) of the ITU, supported by documentary evidence, beginning with its 92nd meeting in 2023 and continuing through its 99th meeting in 2025. The RRB ruled in favor of Iran, obligating the operator and its licensing State, the United States, to immediately cease providing unauthorized services and to comply fully with ITU regulations. To date, this order remains unimplemented.

Beyond the legal violation, the provision of unauthorized communication services poses cultural, informational, and political challenges, including attempts to distort public opinion, interfere in domestic affairs, and undermine national identity and social cohesion. This form of information dominance

represents an emerging and unlawful dimension of interference in the internal affairs of sovereign States.

## **5. Conclusion and Recommendations**

The Islamic Republic of Iran stresses that mega-constellations, while technologically remarkable, have increasingly become instruments for dominance, unilateralism, and strategic superiority, both in outer space and on Earth. Their current trajectory threatens to transform outer space into an arena of competition and confrontation.

To safeguard the peaceful, secure, and sustainable use of outer space, the international community must urgently:

1. Develop an inclusive and legally binding framework governing the deployment and operation of satellite constellations.
2. Ensure compliance with the principles of the Outer Space Treaty and other international legal instruments.
3. Prevent the militarization and weaponization of mega-constellations and other space-based infrastructures.
4. Promote equitable access to orbital and frequency resources for all States, particularly developing countries.

Only through collective commitment and multilateral cooperation can outer space be preserved as a safe, secure, and sustainable domain for current and future generations.