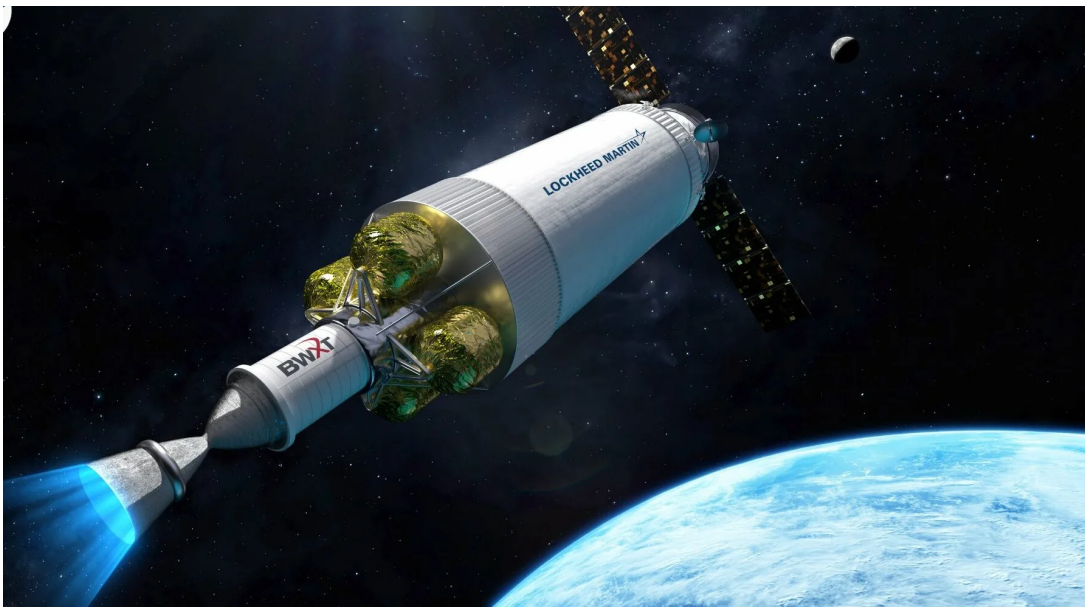


Space, the New Frontier of Defense

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The space domain is of growing importance in global geopolitics, with significant implications for international security. **Space operations**, ranging from satellite observation and surveillance to the management of global communications, have become **essential for the armed forces and national security agencies**. Although space is not yet a theater of direct conflicts, space technologies are increasingly at the center of security strategies. **However, with the increase in space operations, the risk of vulnerabilities and threats to satellite infrastructures also grows.**

Space Technologies in Security Operations

Space is used in numerous areas related to global security, thanks to the ability to operate and control satellites in strategic orbits. The main space applications include:

- **Observation and reconnaissance satellites**: Low Earth Orbit (LEO) satellites, between 300 and 2,000 km altitude, are used to monitor the terrain, gather real-time intelligence, and support field surveillance operations.

- **Radar satellites (SAR)**: Used for surveillance operations in low visibility conditions, radar satellites like the German Lupe, the Italian Cosmo-SkyMed, and the American Onix are crucial for ensuring continuous territory monitoring, regardless of weather conditions.
- **Communication and navigation satellites**: Essential for coordinating security operations, communication satellites like SICRAL (Italy), WGS (USA), and BeiDou (China) ensure secure transmissions and precise localization for drone, missile, and troop operations in the field.

These space technologies offer extraordinary capabilities for global security operations, enabling the collection of essential data and support for surveillance and control activities. However, the growing reliance on these resources also exposes new risks.


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Threats and Risks to Space Security

Space, while not having been a theater of direct conflicts, is an increasingly vulnerable target for attacks that could compromise security operations. Attacks against space infrastructures can be distinguished as **irreversible** and **reversible**, depending on whether they permanently or temporarily compromise a satellite's functionality. The main threats include:

1. **Irreversible attacks**:
    - **Anti-satellite missiles (ASAT)**: Designed to physically destroy satellites, these missiles can severely compromise intelligence gathering and communication capabilities.

- **High-power lasers**: Used to damage the sensors and electronic components of satellites, rendering them unusable.
- **Destructive cyberattacks**: Aim to compromise onboard software, causing the permanent loss of satellite functionality.

2. **Reversible attacks**:
   - **Jamming**: Disrupts satellite communications, preventing the proper functioning of transmissions and localizations.
   - **Spoofing**: Alters navigation signals, deceiving the guidance systems of drones, missiles, and vehicles.
   - **Control cyberattacks**: Allow temporarily disabling a satellite or taking control of it for hostile purposes.

If these threats were to increase, they could trigger a series of severe consequences for space security, including the compromise of global communication capabilities, the risk of satellite collisions, and the interruption of surveillance operations.

Impacts on Global Security

Attacks on space infrastructures would not only weaken a country's security but could destabilize the entire global communications system. In a scenario where multiple satellites are destroyed or compromised, enormous amounts of space debris could be generated, increasing the risk of collisions in space, known as the **Kessler Effect**. This would render some orbits unusable for years, reducing global access and security to space.

Moreover, the interruption of navigation and communication signals, fundamental for the coordination of operations, would increase the risk of operational errors and malfunctions in security operations. This could lead to global incidents involving drones, missiles, and ground units.

The growing use of jamming and spoofing represents another threat to space security, making navigation and defense systems that depend on the precision of satellite signals vulnerable. The compromise of space security not only exposes the armed forces but also damages geopolitical stability, creating an imbalance between nations with access to these advanced technologies

and those that are excluded.

Regulation and International Cooperation

To ensure space security and prevent conflicts related to its management, it is essential to develop **multilateral agreements** that promote the peaceful use of space technologies and reduce the risks of escalation. Among the most significant initiatives are:

- **The Outer Space Treaty (OST) of 1967**: This treaty establishes that space must be used for peaceful purposes and for the benefit of humanity, although it does not explicitly address conventional weapons or technologies like ASATs.
- **Proposals for strengthening space security**: In response to the OST's gaps, new proposals have emerged such as the **Code of Conduct for Space Activities**, which aims to establish clearer rules for the use of space technologies in security and promote transparency among nations.
- **UN initiatives for preventing the arms race in space**: The proposal to expand the Outer Space Treaty to prohibit the development of space weapons is an important step to avoid military escalation in space.



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If these conventions and proposals were to gain the consensus of the main space powers, it would be possible to build a deterrence system based on cooperation and transparency. Shared information on space activities and the creation of dispute resolution mechanisms could significantly reduce the risk of accidental conflicts and ensure safer and more peaceful space

management.

Space security operations are essential for protecting critical infrastructures and ensuring global stability. However, the increase in threats to space resources poses significant risks that could compromise global security. It is therefore crucial that nations collaborate through international agreements, shared regulations, and transparency initiatives to ensure the peaceful use of space and prevent future conflicts. Space cooperation is the key to global stability and security in a world increasingly dependent on space technologies.