Rendezvous and Proximity Operations in the Legal Grey Zone of International Space Law

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Space exploration has expanded dramatically in scope, actors, and applications. This growth has fueled innovation for humanity but also produced congestion, competition, and rising security concerns. As more States rely on satellites for national security and civilian needs, counterspace capabilities have evolved in parallel. Secure World Foundation declared co-orbital weapons as one of the counterspace capabilities in its Global Counterspace Threat Assessment (2026). It defines a co-orbital weapon as "weapons that are placed into orbit and then maneuver to approach the target to attack it by various means, including destructive and non-destructive."

Rendezvous and Proximity Operations (RPOs) technologies are inherently dual-use and come under the umbrella of co-orbital weapons. Rendezvous is the process of intentionally bringing two or more space objects into an orbit by orbital maneuvers such as "matching the plane altitude and phasing." Proximity operations are a series of maneuvers a satellite does in the same or nearly the same orbit in the vicinity of another space object for a specific time duration to accomplish mission objectives.

RPOs have civilian and commercial uses such as refueling, repairing, on-orbit inspection, and life extension. However, RPO technologies can come under counterspace capabilities, as the intention of maneuvering a satellite can be misinterpreted. States' risk assessment plays a key role in perceiving an RPO satellite as a threat or not. Moreover, RPO satellites can perform functions such as surveillance, disruption, or decryption of signals, jamming communication, interference with optical sensors, grabbing a satellite, and releasing high- or low-velocity co-orbital kinetic anti-satellite weapons.

RPOs are not a new phenomenon. However, States are increasingly building sophisticated RPO technologies amid today's space competition. The U.S., Russia, and China have conducted multiple RPOs and exhibited their capabilities. The U.S. does not have any dedicated program for developing co-orbital counterspace weapons; however, it conducted multiple RPOs in both Low Earth Orbit (LEO) and Geostationary Earth Orbit (GEO). These activities included targeting, tracking, and hit-to-kill (HTK) intercept technologies that can be potential co-orbital anti-satellite capabilities. The U.S. conducted 5 RPOs in 2025 in GEO that maneuvered closely to their own satellites and Chinese satellites as well. Moreover, the Delta 180 mission was a showcase of offensive capabilities such as physical collision to destroy a satellite.

Russia has actively invested in and performed various RPOs in recent decades in both LEO and GEO. Russia is building its anti-satellite (ASAT) capabilities out of the mothballs of the Cold War. Many satellites of the Cosmos series and Luch satellites were launched under RPOs for purposes such as co-orbit inspection, intelligence collection, and surveillance. Some of these satellites, such the Cosmos series, were co-planar with U.S. satellites. Such RPOs can result in supporting target identification and tracking, intercepting broadcasts, or jamming radio waves,

thus hampering satellite communications. Russia did not explicitly test co-orbit hit-to-kill (HTK) weapons. However, it has assessed deployment of aerosol or cloud, and multiple subsatellites or payloads at low and high velocities. There are speculations that the Burevestnik program may have been launched by Russia to develop a co-orbital ASAT program. Russia can develop a co-orbital ASAT weapon by deploying a high-velocity payload.

China is also a major actor in space. It has conducted various RPOs in both LEO and GEO. The first RPO by China was conducted in 2010 that involved SJ-12 and SJ-06F satellites. In 2025, China launched SJ-21 and SJ-12 02 for RPOs. The latter came within 60 km of the U.S. satellite USA336. The closest RPO was conducted by SJ-17, which had a robotic arm, which approached the target satellite within 1 km for detailed inspection. The potential military utility of Chinese RPOs is to demonstrate on-orbit space situational awareness (SSA), satellite servicing, inspection, and imaging capability. There is no publicly known evidence that China has tested any offensive co-orbital weapons to destroy any space object.

RPOs of major powers tighten the security dilemma as States perceive others' actions as offensive. There is a legal loophole in the Outer Space Treaty (OST) (1967) on RPOs. Some general clauses explain how a State should conduct an RPO, however, it is largely founded in the basic guidelines. For instance, Article XI of OST obligates States to inform the UN Secretary-General, the public, and the international scientific community. However, States only provide generic descriptions and avoid transparency. Similarly, Article IV (Registration Convention) requires States to register specific details, but they can register information that meets a general function to avoid revealing potential dual uses. Article XI (OST) suggests that States shall act with "due regard" to the other States' interests. "Due regard" is vague, as inspecting and surveilling a satellite might not be considered as offensive as kinetic ASATs. There is no legal way to limit the extent of proximity between two satellites involved in RPO. Another problem that international space law cannot address is the intent of an RPO. States can undertake RPO for military purposes but publicly project it as peaceful uses. The absence of baseline norms increases the risk of misreading intent, which can prompt sudden escalation.

Conclusion

Addressing RPO-related risks requires a multi-pronged approach centered on dialogue, transparency, and verification. States should begin by discussing agreed definitions of behavior for military space activities, as the phrase "peaceful exploration" is vague. A shared definition of threatening RPOs will help avoid any misinterpretation by any country. States shall make pre-notifications and avoid going into others' "keep-out" zones, i.e., high-value GEO assets. A multilateral Space Situational Awareness mechanism would reduce the threat for States with weaker tracker systems. Defining an escalation framework for RPOs using clear vocab, for example, "likely benign," "warrants inquiry," and "imminent threatening, will avoid any offensive response based on perceived worst-case scenarios. Direct, fast-channel, bilateral crisis hotlines should be established to reduce miscalculation risk.

Ultimately, RPOs are dual-use technologies that can quickly be perceived as offensive. All major powers use them for inspection and imaging, yet proximity to another State's satellites will

always raise alarms. Without norms and transparency, RPOs risk triggering dangerous episodes in outer space. Major powers must prioritize stability and take concrete steps to prevent escalation and preserve peace in an increasingly contested domain.

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