Capítulo 4
THE PROSPECTS OF BRAZIL'S STRATEGY TOWARDS THE PLEDGE ON NON-DESTRUCTIVE DA-ASAT MISSILE TESTS

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The counterspace capabilities background

Outer space is essential to meeting many daily-life needs of citizens and the smooth functioning of the world economy in the 21st century (ACSC, 20023; Space Foundation, 2023), while it is also becoming increasingly relevant for military operations, enabling and enlarging the amount of force multiplier options and opening fresh and innovative possibilities in times of peace or war. Thus, some military powers are actively seeking counterspace capabilities to interfere with, disrupt, or deny the space capabilities of potential adversaries (Brown, 2006; ACSC; AWC, 2023).

Since 2018, unclassified, open-source reports by the Secure World Foundation (SWF) and the Center for Strategic and International Studies (CSIS) have annually documented the growing inventory of counterspace capabilities being developed, tested, and operationalized by an increasing number of States. Currently, counterspace capabilities can be broadly classified into two categories: kinetic and non-kinetic. Kinetic anti-satellite (ASAT) weapons are those designed to destroy a targeted space object through a collision or an explosion. Non-kinetic ASAT weapons include directed energy weapons, radiofrequency interference, and cyber-attacks. These two different kinds of weapons have various results on the targeted satellite and the space environment. Kinetic ASAT weapons are designed to destroy a satellite, producing a large amount of orbital debris, also producing effects that are permanent and irreversible. Non-kinetic ASAT weapons can be designed to disrupt or disable a satellite, either temporarily or permanently, and their effects can sometimes be reversed. Kinetic ASATs can be further classified into two subcategories; they can be direct-ascent (DA) when launched from Earth to strike a target in space directly, or they can be co-orbital, meaning that they only strike after they are placed in orbit some time before (Weeden; Samson, 2024; Swope *et al.*, 2024).

The Secure World Foundation and CSIS reports document the conduct of ASAT tests. To date, only the United States, Russia, China, and India (in chronological order) have conducted destructive ASAT tests in orbit. The reports also document the counterspace capabilities currently being developed by Australia, France, Iran, Israel, Japan, North Korea, South Korea, the United Kingdom, and even non-State actors (Weeden; Samson, 2024; Swope *et al.*, 2024).

While no country has ever destroyed another country's spacecraft, the sixteen destructive tests conducted since the 1960s have constituted the most significant space debris-producing events in Earth's orbit since the beginning of the Space Age in 1957 (Martinez, 2023). Most of these tests were performed by the United States and the former Soviet Union during the Cold War. Then, there were no such tests from the mid-1990s to the mid-2000s. However, in this century, there have been direct-ascent anti-satellite missile tests performed by China (2007), the U.S. (2008), India (2019), and the Russian Federation (2021).

This recent reality is concerning because such tests can produce long-lived debris that can pose a collision risk to current and future satellite operations, space launches, and manned missions. Altogether, these tests have created over 6,800 trackable pieces of orbital debris, of which more than 3,400 are still in orbit and pose hazards to satellites and human spaceflight (Weeden; Samson, 2024). The Chinese test in 2007 was the highest registered cause of debris generation, with 3,533 trackable pieces cataloged, and the Russian test in 2021 came in second place with more than 1,807 trackable pieces (Pardini; Anselmo, 2023; Weeden; Samson, 2024). Additionally, the sheer energy of impact can spread debris from these tests out well beyond the impact altitude, as much as hundreds or even 1,000-plus kilometers farther above the impact altitude. This dynamic is significant because the higher up the debris is, the longer it will take to deorbit (which could take decades or even centuries), and thus, the longer it can threaten other space objects, satellites, or space stations (Murtaza *et al.*, 2020).

Debris from the most recent test, conducted in 2021 by the Russian Federation, has threatened the International Space Station (ISS) and the Tiangong Chinese Space Station (CSS), endangering the lives of all ten humans in space (Bartels, 2021; Pardini; Anselmo, 2023). It created surges of close approaches, in some cases tens of thousands in a week, dubbed "conjunction squalls" by the space situational awareness company COMSPOC. These were conjunctions with active remote sensing satellites in sun-synchronous low Earth orbit (LEO). This debris also posed thousands of potential close approaches with some satellites from the Starlink constellation (Langster, 2022) and even with some Brazilian military satellites, such as a couple of Lessonia Synthetic Aperture Radar (SAR) (Martini *et al.*, 2023), requiring a commensurate number of Predetermined Debris Avoidance Maneuvers (PDAMs), which decrease the satellite's useful operational lifespan because of the fuel used for these maneuvers.

The continued performance of destructive anti-satellite tests in the absence of an international outcry can establish a sort of negative norm that debris-producing ASAT weapon tests are acceptable and thus encourage more countries to conduct them. That, in turn, runs the risk of leading to the proliferation of such direct-ascent anti-satellite (DA-ASAT) capabilities and inadvertent escalation or even possible deliberate use of such weapons during a conflict.

Because of such concerns by a growing number of States, in December 2022, the United Nations General Assembly passed resolution 77/41, which calls upon States to voluntarily pledge not to conduct such destructive direct-ascent anti-satellite missile tests. Brazil was among the 155 States that voted favorably for that resolution (2022b).

Accordingly, this study aims to examine how a potential Brazilian commitment to non-destructive DA-ASAT testing could align with its strategy and contribute to its leadership in advocating for responsible space activities. This research is crucial to understanding the potential implications of Brazil's strategic position towards this pledge called for by the U.N. It contributes to international efforts to promote responsible behavior in outer space and mitigate the risks associated with its weaponization.

1 CURRENT INTERNATIONAL MEASURES AND BRAZIL'S APPROACH

Given the growing global reliance on satellites and space applications, many in the international community began calling for a ban or prohibition on the testing of destructive ASAT weapons in space. However, such a call carried little weight unless at least one of the central space powers with this capability would be prepared to step up to make such a commitment. In April 2022, the United States became the first country to declare a commitment to no longer conduct destructive DA-ASAT missile tests. In announcing this unilateral measure, Vice President Kamala Harris said that the U.S. would seek to establish this measure of restraint as "a new international norm for responsible behavior in space" (United States, 2022).

This movement gained further momentum when, in late 2022, fifty-two countries co-sponsored a United Nations General Assembly (UNGA) resolution to draw attention to this issue at the highest levels of global governance. On December 7th, 2022, the UNGA adopted Resolution 77/41, which, in its preamble, notes with concern that the use of hit-to-kill anti-satellite systems might have widespread and irreversible impacts on the outer space environment sustainability. This resolution "calls upon all States to commit not to conduct destructive direct-ascent anti-satellite missile tests" as "an urgent, initial measure [...] while also contributing to the development of further measures for the prevention of an arms race in outer space".

The resolution was passed with the overwhelming support of one hundred fifty-five countries that voted in favor, nine countries that voted against the resolution, and nine that abstained (U.N., 2022a). Brazil was a co-sponsor of UNGA Resolution 77/41 and also voted in support of it. To date, thirty-seven countries have made the commitment envisaged in this UNGA document. Resolution 77/41 was one of several resolutions connected to preventing an arms race in outer space (U.N., 2022b). In addition to supporting such a resolution, Brazil also supported a long-standing No First Placement of weapons in space and a "bottom-up" approach, where States voluntarily commit themselves to some principles before discussing some normative legally binding instruments (LBI). Its representatives stated, "The commitment to end these tests would be a first but significant step towards an improved environment for the negotiations on outer space security, notably on PAROS", the Prevention of an Arms Race in Outer Space (Sooi, 2023).

Industry has also added its voice to the calls for ending destructive anti-satellite tests in orbit. In November 2023, close to the second anniversary of the 2021 anti-satellite test, more than two dozen companies released an industry statement calling for an end to hit-to-kill direct-ascent anti-satellite missile tests, and more companies have joined this group since then; as of this writing, there are 49 companies from 14 countries who have signed this statement of concern (SWF, 2023).

2 BRAZIL AS AN EMERGING PEACEFUL POWER

Brazil positions itself as a peaceful leader on the global stage and has been a proactive participant in international organizations like the U.N., advocating for worldwide cooperation and sustainability, leading climate change dialogues, and promoting biodiversity conservation.

In 2012, the former Brazilian Minister of Foreign Relations (1993-1995 and 2003-2010) and then Minister of Defense (2011-2015), Celso Amorim, wrote an article about the "Defense Policy From a Peaceful Country" in which he argued on Brazil's aspiration to enforce itself as a peaceful growing power, an intention formalized in the country's National Defense Strategy (END) since 2008, in the National Defense Policy (PND) since 2012, and in the Brazilian Defense White Paper (LBDN) also from 2012. This peaceable principle has been reinforced in all the 2024 versions of those documents.

Brazil seems to bet on its soft power as a primary source of smart power in international relations. Even though this statement is subject to debate and will likely always be, it gains credibility when some indicators are observed. The country has the 5th largest national territory, the 7th biggest population, and the 11th Gross Domestic Product (GDP) in 2024 (WBG, 2024). These metrics underscore its potential influence on the global stage. Its hard power — typically associated with military might and economic leverage — also remains abstract and hard to measure. Analytical methods used to evaluate hard power often face criticism for their subjective nature and variability. For instance, Global Firepower ranks Brazil 12th out of 145 in terms of military strength (GFP, 2024). However, its military spending is relatively modest, ranking 18th globally, with $ 50.7 billion, or 1.1% of its GDP (Tian *et al.*, 2023). The intention here is not to conclusively prove that Brazil's soft power outweighs its hard power in shaping its overall smart power. Instead, this discussion aims to position soft power as a complementary and perhaps crucial element of Brazil's strategic approach. Soft power is inherently aligned with Brazil's diplomatic identity and international behavior, emphasizing cultural influence, diplomatic engagement, and the promotion of peace and sustainability.

Brazil and its governmental institutions are fully committed to democracy and individual freedom. Internationally, it supports the self-determination of all countries and follows a non-interventionist approach. World War II was the last time Brazil took part in a war, among the Allies, which ended on September 2nd, 1945, with Japan's surrender. This means that Brazil will reach 80 years of formal peace in 2025. The country is committed to diplomatic resolution of international conflicts, recognizing the U.N. as the forum for achieving such peaceful agreements. Since the Roboré Accords in 1958 (Conduru, 2001), it has had no formal frontier disputes with any of its ten bordering countries, nor any major diplomatic conflict with any of those ten bordering countries or the two non-bordering South American countries, namely Chile and Ecuador. At the same time, Brazil offers support to U.N. peace operations abroad, as when it led the U.N. Stabilization Mission in Haiti called MINUSTAH.

Along with India, Germany, and Japan, Brazil is part of the G4 Nations, bidding together to reform the U.N. Security Council (UNSC). Each one of them has asked for a permanent seat on the UNSC, which presently has only five permanent members (the P5): China, France, Russia, the United Kingdom, and the United States, with the power of veto. The self-commitment to ban destructive DA-ASAT missile experiments would be another showcase of Brazil's peaceful intentions and dedication to responsible behavior, supporting its request for a permanent seat at the UNSC.

The Brazilian Space Agency Strategic Plan (2023-2026) (AEB, 2023) relies on secure and continued access to space to foster its Space Activities National Programme (PNAE) (AEB, 2022a). The agency falls under the Ministry of Science, Technology, and Innovation (MCTI). To this end, much effort has been directed to turn the Alcântara Launch Site (CLA) into an operational and competitive spaceport (AEB, 2022b). Even its defense counterpart, the Space Systems Strategic Program (PESE), under the Ministry of Defense (M.D.), aims to promote dual-purpose space systems, not only for defense, but with scientific, exploratory, and commercial intents for society. Destructive DA-ASAT missile tests would create debris that would undermine this dual-purpose approach prioritized by the PESE. This reflects Brazil's intention to ensure that its military activities in space will not undermine the country's ability to access and conduct civilian and military operations in outer space in the future, thus extending the thinking of environmental sustainability towards outer space.

3 WHY DESTRUCTIVE DA-ASAT MISSILE TESTS MIGHT NOT BE STRATEGICALLY ADVANTAGEOUS

DA-ASATs demand high investments in technology development, testing, maintenance, and deployment (Murtaza *et al.*, 2020). In an era of low-cost small satellites, this makes them more costly than most of their potential targets. Disabling satellites is literally the dirtiest option, as a single successful strike can generate hundreds to thousands of orbital debris. And that debris poses a danger to any space operation as it travels at extremely high speed. Such destruction may cause fragmentation that could lead to an even higher amount of debris, increasing the danger to other orbital assets in a decades-long cascade effect known as Kessler Syndrome (Kessler; Cour-Palais, 1978).

So, if Brazil chose to develop and test such a capability, it would endanger its seventeen current active payloads on orbit (Celestrak, 2024), the satellites from other countries it relies on, and future missions to LEO from all countries.

A DA-ASAT attack would, in effect, not only be against a targeted country but likely against the whole world since even the non-space-faring nations rely on services provided by orbital systems. Such damage to the crucial space infrastructure would be scientifically, economically, and diplomatically harmful. This move, either as a proof-of-concept against one of a country's own assets or as a military operation against an enemy, could even encourage some military retaliation from non-presumed and/or unpredicted adversaries, resulting in conflict escalation and might not necessarily restricted to the space domain. In any case, it would potentially be a strategic setback.

Additionally, given how many operators are shifting to a proliferated constellation model (ACSC, 20023; Space Foundation, 2023), there is a decreasing amount of military utility in DA-ASATs because a kinetic strike in a more congested orbital environment severely increases the Kessler Syndrome threat. And even if a very precise strike takes out a satellite and does so while creating only a limited amount of debris, it would still be of limited benefit since the other satellites in the constellation could offer redundancy and work together to ensure the mission's objective was still carried out (known as mission resilience). Moreover, a DA-ASAT has highly visible, permanent, and irreversible results, and there is no plausible deniability in terms of who launched it (Weeden; Samson, 2024).

As such, it is increasingly perceived as an unusable weapon (Rao, 2023), raising the question of why a country would want to invest in developing or acquiring such a capability that harms the operating environment indiscriminately and provides little military benefit. Considering the limited resources available to Brazil (or any country) to choose its weapon systems smartly, the DA-ASAT covers an extremely unlikely scenario for Brazil's interests since a kinetic strike against a satellite is often seen as a last resort that risks hindering or precluding space operations in the affected orbits for long periods. Strategically, DA-ASATs are not cost-effective.

Since weapons designed for other uses could be adapted as DA-ASATs, they work both as deterrent and insurance policy, making such spaceflight-testing “unwise and unnecessary” (Krepon; Black, 2009). Indeed, there are much cleaner, more precise, more discrete, and even affordable means of space defense to disable or disrupt satellites and/or deny an adversary the use of their space capabilities. Electronic warfare and Cyber ASAT strikes leave few “fingerprints”, making it hard for both to attribute responsibility (Swope *et al.*, 2024). Their tests are less available to Open-Source Intelligence (OSINT) and public acknowledgment. Electronic warfare and Cyber ASATs may result in damages that are reversible, resulting in the temporary disruption of the target’s operation, thus avoiding permanently turning the targeted satellites into large, persistent, and harmful orbital debris.

Furthermore, while the DA-ASAT test moratorium pledge requires refraining from destructively testing them in orbit, it does not prevent the research and development of this type of capability, should Brazilian strategists and decision-makers decide Brazil still wants to investigate it. So, the pledge does not limit the country’s hard power options but rather increases its soft power.

Final considerations

Space lies at the nexus of national and global development, peace, and security. Space is both a subject and an object of national policies and part of a nation’s ability to project and exercise both soft and hard power. At the same time, space is a shared domain, and as it becomes more congested, the importance of safe and responsible behaviors will increase. Political scientists carefully ponder how promoting responsible behaviors through space policy could offer Brazil some opportunities to be both a global leader and to shape international conversations about space security and long-term space sustainability, influencing the future governance framework.

This work offers an example of where Brazil could make a unilateral commitment not to conduct destructive DA-ASAT missile tests, later seeking to lead other like-minded States to advocate for international sanctions against such tests for the benefit of orbital longevity in terms of access and stability.

This, combined with Brazil’s non-alignment and commitment to any parties in any armed conflicts post-World War II, could strengthen its position to lead some of the current multilateral discussions, particularly those on outer space policies, norms, rules, and principles that will shape the evolution of the global space arena for generations to come.

Brazil’s commitment to abstain from destructive DA-ASAT testing seems to align with its broader diplomatic ethos, reinforcing its image as a nation that prioritizes the long-term security and sustainability of internationally shared domains. This approach could not only enhance Brazil’s international reputation but also solidify its influence in shaping policies that favor collective security and peaceful coexistence.

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