

The Missile Technology Control Regime At A Crossroads: Export Controls, Standoff Warfare, And The Challenge Of Space Weaponization

¹ Shanzay Saeed, ² Dr Farhat Konain Shujahi, ³ Prof. Dr. Ahmed Saeed Minhas

¹Research Scholar, Cardiff University, Cardiff, Wales, United Kingdom. Corresponding Author: shanzaysaeed01@gmail.com

²Assistant Professor, IR Department National University of Modern Languages (NUML). farhatkonain@numl.edu.pk

³ Vice Chancellor, DHA Suffa University, Karachi, Pakistan ahmedsaeedminhas81@dsu.edu.pk

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Abstract

The Missile Technology Control Regime (MTCR), which was formed in 1987, will limit the spread of missiles, uncrewed aerial vehicles (UAVs) and related technologies that can carry a payload of 500 kg to a range of at least 300 km, as well as systems designed for carrying weapons of mass destruction (WMDs). The effectiveness of the regime is in serious doubt almost 40 years after its establishment. Without a binding treaty or formal enforcement mechanism, the MTCR gives powerful countries the means to limit their rivals without excluding their allies, and thus is more of a protector of technological monopoly than a real non-proliferation tool. Taken together, these capabilities are a testament to the fact that determined states will arm whatever civilians are allowed to develop, in this case, space launch technology, and convert it into anti-satellite weapons, and that the potential for standoff precision strikes in more than one theatre of conflict is growing across the board. The regime's Equipment, Software and Technology Annex, which classifies the controlled items as "Category I" (full systems and production facilities) and "Category II" (dual-use items), is considered outdated, applied in an arbitrary manner and technologically inadequate for hypersonic weapons, commercial space vehicles and the proliferation of armed drones. In a qualitative case study approach with Iran, India, Israel and the United States as case studies, this paper examines the achievements of MTCR in curbing missile proliferation and recommends six structural changes to rebuild MTCR's credibility and effectiveness.

Keywords: Missile Technology Control Regime; Missile Non-Proliferation; Space Weaponization; Standoff Warfare; Arms Control

1. Introduction

The rules are lagging behind the world. Seven industrialized countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) united in 1987 because of their mutual fears that the proliferation of missiles with nuclear, biological, or chemical payloads might threaten international peace. This led to the formation of the Missile Technology Control Regime (MTCR), officially announced on 16 April 1987 (Nuclear Threat Initiative [NTI], 2025a). The basic, explicit

principle of its strategy was to limit the export of missiles and missile technologies in the range of at least 300 kilometers (km) carrying a payload of 500 kg (Arms Control Association, 2025b). However, it is now clear that the MTCR has failed to achieve its goal of curbing the proliferation of missiles and drones, as evidenced by the medium-level conflict between the US and Iran in 2025 and 2026, in which Israel was actively involved on the side of the US. That war marked a new paradigm of war: none of the three sides had troops on the ground, and they extensively used missiles, combat drones and conventional air power (Al Jazeera, 2025a). This fact should trigger a review of the effectiveness of the MTCR to find out which steps are missing to make sure that other countries are not allowed to proliferate more missiles and drones.

The MTCR was based on a simple concept. When missiles began, it was all focused on the few most industrialized countries. If those states agreed not to provide the essential parts, materials and information that would enable developing countries to build long-range missiles on their own, it would be much more difficult for those countries to do so. The idea of the regime was to create a barrier of technology to stop the dangerous delivery systems in the hands of dangerous people.

That wall is now almost 40 years old and is cracked. While the MTCR has 35 member states (MTCR Chair, 2016), a number of non-member states possess missile stocks that would have been unfeasible in 1987. Iran has over 3,000 ballistic missiles varying in range (Arms Control Association, 2025a), and North Korea has tested intercontinental ballistic missiles (ICBMs) that could hit the U.S. mainland (Kimball & Reif, 2018). A twelve-day war between Iran and the United States and Israel, in June 2025, saw Iran attacking the U.S. military in the Middle East with ballistic missiles and drones directly, showing that technology denial states are not able to prevent a determined state from arming itself (Al Jazeera, 2025a). This was repeated in the same war with the same combatants in 2026.

The second, equally sinister aspect is India. It joined the MTCR in 2016 with its arsenal of ballistic missiles intact and, in 2019, conducted a successful anti-satellite (ASAT) weapon test with its space-weapons capability (Government of India, Ministry of External Affairs [MEA], 2019), being the fourth country to do so in the world. In essence, the technology for launching space rockets that the rules of the MTCR were developed to inhibit had been adapted by one of the regime's own members to become a weapon. The transfer of seemingly civilian technology within India to military use is not recent; it was with the 1974 nuclear test, named "Smiling Buddha," whereby the country used civil nuclear technology to develop weapons and in 2019 it was with the ASAT test, "Mission Shakti" or "Strength," which used civil nuclear technology in the development of weapons. The episodes do bring up a valid concern: are technologically advanced States really trying to stop proliferation or just trying to maintain their own strategic edge?

In this context, it is critical to evaluate how effective the MTCR has been in limiting the spread of missiles and what structural changes are needed to make it more effective, especially in the context of the impending conflict between Iran and the U.S. in 2025–26 and India's space weaponization efforts. This paper makes the argument that the design of the regime is voluntary and consensus-based, that it has a narrow threshold for 300 kilograms / 500 kilometers of launch distance, that its space-launch-vehicle loophole has yet to be resolved, and that its membership practices are selective and politically influenced, thereby undermining its non-proliferation role despite the increasing role of missiles and drones in today's conflict.

1.1 Rationale

The use of missiles and drones has shifted from strategy's sideline to its mainstay. That export-control systems designed for the Cold War-era proliferation problem are now falling behind current practice is demonstrated by the 2025–2026 Iran–U.S.–Israel conflict, India's post-accession space-weapons program and the routine use of standoff precision strikes from Gaza to the Gulf. It is important that policymakers develop the next generation of arms control instruments

in the wake of the failures of the MTCR, and that scholars evaluate the potential for continued viability of voluntary, supplier-side arms control in a multipolar security architecture in the wake of the MTCR failures.

1.2 Problem Statement

In more than 39 years of existence, the MTCR has not stopped determined non-member countries like Iran from developing big indigenous missile stockpiles, nor has it stopped member countries like India from using MTCR-exempted civilian space technology for anti-satellite weapons. It is now structurally incapable of combating armed drones, commercial space-launch systems and hypersonic weapons, as it is voluntary, decision-making is consensus-based, its Annex categories are outdated, its membership is inconsistent, and many questions have been raised about the relevance of this non-proliferation instrument.

1.3 Research Questions

1. To what extent has the MTCR been successful in halting the spread of missile and drone technology among member and non-member nations?
2. What are the structural and normative weaknesses of the MTCR revealed by the two events of Iran and India?
3. What sort of changes would make the MTCR an effective and fair non-proliferation regime?

1.4 Research Objectives

- To assess the success of the MTCR in curbing proliferation of missiles and drones since 1987.
- To analyze, in the context of Iran and India, why the regime has been unsuccessful in preventing proliferation from both non-member and member states.
- To suggest structural and institutional changes that can bring back the credibility and effectiveness of the MTCR.

2. LITERATURE REVIEW

The academic and policy debate around the MTCR takes common ground on three main issues. The first is that the regime is informal and non-binding. As the U.S. Department of State (2009) argues, the MTCR is an “informal political understanding between states” and adherence to such supplier-side export-control cartels is motivated, as Klomp (2022) demonstrates, not by legal obligations, but by the economic and diplomatic power exercised by the dominant members. This voluntary structure is the common explanation, found throughout the literature, for the regime's uneven implementation (Brockmann et al., 2022).

The other theme is the government's unmet dual-use challenge. The MTCR's unresolved vulnerabilities have repeatedly been identified by SIPRI analysts as one of the key problems and overlaps between space-launch-vehicle (SLV) technology and ballistic-missile technology (Bauer & Bromley, 2022; SIPRI, 2023). This ambiguity was explained by Krepon (2001), who argued that the technological distinctions between anti-satellite weapons, anti-ballistic-missile interceptors, and space-launch vehicles are minimal and, in fact, the use of the weapons is primarily determined by state intentions. The same can be said of the proliferation of cruise missiles, which Gormley (2008) argues fall below the “real range” thresholds he set during the Cold War.

A third theme is the selective and politically charged use. Pakistani officials and researchers have long asserted that MTCR regulations are more stringent and have a disproportionate impact on non-Western programs, compared with their impact on Western industries (Khan, 2020; Pakistan Ministry of Foreign Affairs, 2024). This asymmetric treatment is seen as the most prominent example in this literature of the 2016 accession of India as compared to the case of Pakistan, which remains outside despite being denied access to the clubhouse (Dawn, 2016; Eurasia Review, 2016). A more recent critique is that the United States has given the regime unilateral permission to reinterpret Category I/II boundaries to allow for the export of drones, which are more recent items (Arms Control Association, 2020, 2025c; Kerr, 2025).

Each of these qualities of the MTCR — informality, exemptions from the dual-use, and selection — has been documented in the literature in isolation. What has not been studied as much is the intersection of the three vulnerabilities in one current crisis: Iran and the United States and Israel in 2025-2026, and India's post-accession space-weapons program. In this paper, this gap is filled by following both cases in the same analytical frame.

3. METHODOLOGY

The research design of this paper is qualitative and case study research. It relies heavily on primary sources, such as official government statements, texts of treaties and guidelines and authoritative policy briefs from various recognized research institutes, including SIPRI, the Arms Control Association and the Congressional Research Service. These are factual sources that include in their text information about the legal structure of the MTCR, the conflict in time and national policies. The theoretical discussion is framed with secondary literature from strategic studies and international relations scholarship, and is interpreted using secondary literature on the question of why states behave as they do in conditions of technology denial.

The study adopts a comparative case study methodology focusing on four actors: India, Iran, Israel and the United States, whose security policies and export control regimes have had the greatest impact on the present course of the MTCR. The analysis does not claim to be exhaustive in its listing of all missile programs; rather, it relies on a few detailed cases, with descriptive quantitative data (when available) on missile inventories, and then generalizes and draws conclusions about the effectiveness or lack of effectiveness of a set of technology-denial regimes, and the persistence of threat-driven state behavior. To minimize single-source bias, data were triangulated from multiple government, think tank, and credible news sources, and process tracing was conducted to link the design decisions made by the regime to the observed outcomes of proliferation.

4. The MTCR: Structure And Inherent Weaknesses

4.1 The MTCR Can And Cannot Do

The MTCR is not a treaty. It does not impose any binding obligations. It is, according to the U.S. Department of State (2009), "an informal political understanding among states. Member states agree to implement common export-control policies on a common list of controlled items (the MTCR Annex), but each implements these policies through its own national law, and has final authority over each export action (Missile Technology Control Regime [MTCR], n.d.). Voluntary compliance is not driven by principle but rather by the economic, political and diplomatic power of the dominant members, particularly the USA and its allies, over other members (Klomp, 2022). If states do not comply with the regime's directives, this can lead to fewer trade relations or to a lesser priority in bilateral relations, the coercive-leverage mechanism that enables the regime's informal power.

4.2 The Membership Gap

The 35 members of the MTCR do not include some of the world's most significant missile-technology actors. Of particular importance is the lack of China in the full membership list: China's involvement in missile programs of other nations, like Iran and North Korea (NTI, 2025b), has been identified on a regular basis. A system to check transfer of missile technology cannot be all-encompassing if one of the world's biggest exporters of missile technology is outside its scope, thereby creating an impression that export control cartels are political and not truly dedicated to non-proliferation.

4.3 What is the Dual-Use Technology Problem?

From the outset of the existence of the MTCR, it has recognized, but withheld a solution to this structural difficulty – that the technology of space-launch vehicles is "virtually identical to that of a ballistic missile" (MTCR, n.d.). The regime's declaration is clear that it is "not designed to impede national space programs" (MTCR, n.d.); however, it leaves a regulatory loophole which can be taken advantage of by sophisticated states. Technologies directly applicable to Iran's longer-range ballistic missiles have been essential to its space-launch program (CSIS Missile Defense Project, 2026); and the technologies adopted for India's civilian space program have served as the technological backbone for India's 2019 ASAT test. However, the Bush administration did not pursue such development following the 2001 Rumsfeld Report that recommended the development of ASAT systems, due to political risk, the potential for an arms race in space and the impact on arms control and anti-ballistic-missile programs, as noted by Krepon (2001), meaning that intent, rather than technology, is what ultimately dictates how dual-use capability is used.

4.4. The 300-Kilometer Threshold Debate: Too High a Bar for Regional Conflicts

The central threshold of the MTCR (the range of 300 km and payload of 500 kg) had been drawn based on the threat assessment of the missiles in 1987. That is a very outdated judgment. Just a little more than 300 km is enough to begin or escalate a state conflict by the use of a missile. The distance between the missile launching sites in western Iran and the targets in the western Gulf countries is roughly 300-500 kilometers, allowing even Iran's shortest range missiles, such as the Shahab-1 and Fateh-110 and Khalij Fars solid-fuel missiles, to reach oil refineries, military bases, airports, and desalination plants in the western Gulf countries (Israel Alma Institute, 2026).

The record displays this hazard. In January 2022, Houthi forces were reportedly backed and trained by Iran and attacked the international airport and oil facilities in Abu Dhabi, killing three people (Relief Web, n.d.). Houthi forces made hundreds of strikes with missiles and drones against Saudi Arabia from 2015 to 2022, striking Riyadh, Jeddah and the Eastern Province (Relief Web, n.d.). Iran's Revolutionary Guard Corps struck facilities hosting U.S. military forces in six Gulf countries with 230 drones and missiles in March 2026, and since the beginning of the war over a 41-day period, Iran launched 6,413 missiles and drones against seven Arab countries before a ceasefire was declared. These figures illustrate the fact that a 300 km missile is not a small toy for the Gulf, it is a strategic weapon capable of a wide range of operations: shutting down oil exports, killing civilians on a large scale, and treating it as a low priority is due to the regime's original focus on intercontinental WMD delivery before regional warfare was even considered (Brockmann et al., 2022). The reform of the MTCR should, therefore, involve a serious re-thinking of the appropriate threshold in a world in which neighboring states regularly threaten each other with the very systems which the MTCR was intended to limit.

4.5. The MTCR Annex Debate: Category I And Category II Under Scrutiny.

The MTCR's Equipment, Software and Technology Annex divides controlled items into two categories. Category I includes the most hazardous systems, unmanned-air-vehicle systems for space flight above the 300-km/500-km threshold, their production facilities and major sub-systems like guidance packages and re-entry vehicles. Transfers are subject to a "strong presumption of denial," and are allowed under only exceptional conditions and subject to binding end-use guarantees (MTCR, n.d.). Partners have more flexibility with Category II, which includes a wider range of dual-use components such as propulsion components, guidance hardware, structural materials, and propellants, and will consider applications on a case-by-case basis (Arms Control Center, 2023).

Both kinds are continually criticized for different reasons. China, Pakistan, India (until 2016), and other developing countries have long contended that Category I controls impact their programs while not significantly affecting the space launch and advanced UAV industries of the West (Dawn, 2016; Pakistan Tribune, 2016). The Pakistani Ministry of Foreign Affairs (2024) has consistently referred to MTCR controls as "biased, politically-motivated, and discriminatory," claiming that those items not on the Annex are also treated as sensitive under 'catch-all' provisions which are applied selectively against unfavored states. Khan (2020) suggests that Pakistan's exclusion from the MTCR raises the question of whether the regime has a structural mismatch that undermines the credibility of the regime in the absence of any merits of particular cases. However, Category II is said to be too open. In July 2020, the U.S. changed the classification of some Category I (strong presumption of denial) unmanned systems, such as the MQ-9 Reaper and Global Hawk, to Category II (no strong presumption of denial) to allow them to be sold to South Korea and Saudi Arabia (Arms Control Association, 2020). In September 2025, Washington reinterpreted MTCR rules to "fast-track" an estimated US\$142 billion (Arms Control Association, 2025c) sale of over 100 MQ-9 drones to the Kingdom of Saudi Arabia. Both moves were denounced as setting unhelpful precedents by European MTCR partners, who argued that the normative distinction between the two categories of weapons would lose its meaning if the most powerful member state of the MTCR were allowed to reclassify advanced weapons to suit the country's commercial and strategic needs. (Kerr, 2025).

4.6. Hypersonic Weapons: The MTCR's Most Critical Blind Spot

The MTCR was never intended for hypersonic weapons. However, Russia, China, the United States, India and Iran have all been developing hypersonic glide vehicles that fly at speeds faster than Mach 5 and can maneuver to evade current air-defense systems. These systems do not fit into either Category I or Category II, and SIPRI has identified this as "a significant and growing vulnerability in the MTCR's architecture" (Bauer & Bromley, 2022). Hypersonic capabilities were gained by India through technology assistance by the MTCR, and Iran used its Fattah-1 hypersonic missile in the 2026 conflict without MTCR membership and without any formal constraint (Military Watch Magazine 2026, Institute for Strategic Studies Islamabad [ISSI] 2025). As yet, the regime has no answer to this challenge.

To overcome this blind spot, 4 changes are needed in the Annex. First, Category I should be broadened to explicitly include hypersonic glide vehicles and maneuvering re-entry vehicles, which are not clearly defined within categories (SIPRI, 2022). Second, the Category II list should be updated to include more ballistic-missile-related, commercial space-launch-vehicle (CSLV) sub-systems and components that use MEMS technology and solid-propellant fuels. Third, the regime should consider a transparent, time-bound technical-review cycle – preferably every 3 years – to update both categories in line with technological change, and to minimize the necessity to rely on consensus-based plenary meetings that are frequently dominated by commercial and

political considerations, thereby reducing the potential for a stalemate in the review process (SIPRI, 2023). Fourth, every change from Category I to Category II should be approved by all 35 member states, and should be made public with an explanation, not by a single partner.

4.7. The India Problem: Selective Admission And Post-Accession Space Weaponization

4.7.1 India's Admission: The "Silent Procedure" and its Implications

On 27th June 2016, India joined the MTCR as its 35th and last member, under a 'silent procedure', which meant that no formal objections were raised within 18 months of the time frame, giving the impression of consensus (Eurasia Review, 2016). The admission was expressly connected with the strengthening Indo-U.S. strategic partnership: U.S. State Department spokesperson Elizabeth Trudeau said that India was admitted because it demonstrated to all MTCR partners a sustained commitment to non-proliferation and it has a legally based, effective export control system (The Diplomat, 2016). However, what was not mentioned was that India also had the "indigenous and well-developed ballistic missile program" for "national security requirements" which was "not dependent on India's membership of the MTCR" (Government of India, MEA, 2016). India has also fully equipped itself with all its series of ballistic missiles, including the Agni-V with an estimated range of 5,000 to 8,000 kilometers, well beyond the MTCR cap of 300 kilometers (Arms Control Association, 2016).

It has important ramifications with respect to the credibility of the regime: if a state that has a viable, above-threshold ballistic-missile program can become a member without surrendering or reducing it, the membership of MTCR does not indicate that the member would be bound by some form of restraint upon its ballistic-missile program, but rather that it would be aligned with the dominant power of the regime. The implications from Pakistan's point of view were direct; India's membership would mean access to high-tech cruise-missile and UAV technologies from other member countries, namely the U.S., and this would improve Pakistan's standoff strike capability against the country, while Pakistan would not be allowed to seek membership itself (Quwa Defense, 2016).

4.7.2 Mission Shakti: An MTCR Member Develops a space weapon

India joined the MTCR a few years ago and has now made its most significant tech demonstration. On 27 March 2019, a modified Prithvi Defence Vehicle Mark-II ballistic-missile interceptor successfully destroyed an old Indian satellite placed in the low earth orbit at approximately 300 km altitude in three minutes of its launch, thus making India the fourth nation in the world to demonstrate ASAT capability after the United States (1985), Russia (1968) and China (2007) (Government of India, MEA, 2019; CSIS Aerospace Security, 2021).

On the non-proliferation side, it was the biggest structural vulnerability that the MTCR had. The interceptor itself was a direct spin-off from India's anti-ballistic-missile program, which is based on technologies acquired from India's civilian space-launch-vehicle program, from which came the DRDO's anti-ballistic-missile interceptor program to the ASAT weapon. All of that way was not subject to the regulation of MTCR under the carve-out rule for civilian space programs. In a recent development, the Indian space agency is transferring its Small Satellite Launch Vehicle (SSLV) technology that can launch satellites weighing up to 500 kilograms into low-earth orbit to a defense manufacturer for around US\$59 million in June 2025 (IBEF, 2025). There was no formal objection from any member state, which was a continuation of the U.S.'s policy of supporting India as a counterweight to China's regional influence.

4.8. The Iran Case: The Most Consequential MTCR Failure

4.8.1 Create an Arsenal of Indigenous Development

The most obvious example of the fact that technology denial is not an effective way to deter a state with an existential threat is Iran's missile program. Iran started purchasing missiles during the Iran-Iraq War (1980-1988), from Libya and Syria (Iran Watch, n.d.). From that base it developed the Middle East's biggest and most varied arsenal of ballistic missiles (CSIS Missile Defense Project, 2026). All of the missiles in that arsenal were designed directly in defiance of the intent of the MTCR, and no one has ever been technically in violation of the regime because Iran is not a member, and so has no formal commitment to it. At the start of the June 2025 conflict, Iranian estimates of the number of missiles in their arsenal stood at around 3,000 (Israel Alma Institute, 2026), and by February 2026, following twelve days of conflict during which hundreds of missiles were launched and various missile factories were targeted, the estimates rose to around 2,500 (Israel Alma Institute, 2026).

Table 1: Selected Iranian Missile and Drone Systems Relative to MTCR Thresholds

Missile System	Type	Range (km)	Payload (kg)	MTCR Threshold Status	Category	Status
Shahab-1	SRBM	300	900–1,000	At/below threshold	Cat I (borderline)	Operational
Fateh-110	SRBM	200–350	300–650	At/below threshold	Cat I (borderline)	Operational
Khalij Fars	SRBM	300	600	At/below threshold	Cat I (borderline)	Operational
Hormuz	SRBM	300	600	At/below threshold	Cat I (borderline)	Operational
Shahab-2	SRBM	500	~750	Above threshold	Category I	Operational
Fateh-313	SRBM	500	350	Above threshold	Category I	Operational
Ra'ad (Cruise)	Cruise Missile	350	450–500	Above threshold	Category I	Operational
Qiam-1	SRBM	700–800	700	Above threshold	Category I	Operational
Zolfaghar	SRBM	700	500	Above threshold	Category I	Operational
Dezful	SRBM	1,000	600	Above threshold	Category I	Operational
Shahab-3	MRBM	1,300	800–1,200	Above threshold	Category I	Operational
Haj Qassem	MRBM	1,400	500	Above threshold	Category I	Operational
Kheibar Shekan	MRBM	1,450	500	Above threshold	Category I	Operational
Sejjil	MRBM	2,000	700	Above threshold	Category I	Operational
Khorramshahr	MRBM	2,000–3,000	1,500–1,800	Above threshold	Category I	In development
Emad	MRBM	1,700	500–700	Above threshold	Category I	In development
Ghadr	MRBM	1,600–2,000	750	Above threshold	Category I	In development
Shahed-136	UAV/Drone	1,000–2,500	~50	Above threshold	Category I	Operational
Fattah-1	Hypersonic (HGV)	1,400	400	Above threshold	Not covered by MTCR	Operational

Source: CSIS Missile Defense Project (2026).

4.8.2 The June 2025 and February 2026 Conflicts and Their Strategic Lessons

The United States and Israel launched simultaneous attacks on Iranian nuclear plants in 2025, and Iran retaliated in kind: On 23 June 2025, it fired 14 missiles at Al Udeid Air Base in Qatar; and its Revolutionary Guard Corps declared a 17th wave against Israeli military bases, such as Nevatim and Hatzerim air bases (Al Jazeera, 2025b). After the death of the supreme leader in the first strike (Reuters, 2026), many observers thought Iran's political system was going to fall apart soon when the U.S. and Israeli strikes resumed on the night of 28 February 2026. Instead, Iran consolidated its state machine, mobilized its command structure and deployed its massive arsenal of missiles to shield it, transforming the battlefield dynamics and making further escalation by the U.S. or Israel costly.

The following three strategic lessons are provided. First, a state that, for decades, denied its people any access to comprehensive technology created an arsenal that could fight the most technologically advanced military power on earth for 12 days. First, a state where people have been denied access for decades to comprehensive technology built an arsenal that could engage the most technologically advanced military power on earth for 12 days. Second, Iran's missile power incurred enough expenses – on allied military bases, shipping from the gulf and the overall escalation logic – to force both sides to reach a ceasefire without Iran's military defeat. Third, despite the re-imposition of sanctions, shipments of the critical solid-propellant precursor sodium perchlorate were confirmed by Western intelligence to continue to reach Iran from China.

4.9. Modern Warfare - The Transformation: Standoff Missiles As The Dominant Instrument.

The strategic environment of the design of the MTCR has undergone a complete transformation. Precision strike is now the dominant form of the modern conflict, as missiles, cruise missiles and armed UAVs are fired at targets located outside of an opponent's defense area (U.S. Department of Defense, 2022). The change is significant for the MTCR because for those states that are not able to match their adversaries in conventional ground or air forces, the capability of conventional missile is now a basic military requirement. The Israel Defense Forces targeted Gaza with over 10,000 precision-guided munitions (PGMs), including GBU-39 Small Diameter Bombs, JDAM GBU-31 V3 kits and Spike missiles (Action on Armed Violence, 2025), and Israel's subsequent actions against Lebanon, Syria and Iran utilized the same standoff strategy (Jerusalem Post, 2021). India had demonstrated the same in Operation Sindoor in May 2025: the same aim has been accomplished by stand-off precision missiles, which would have otherwise required high-risk air-vehicle missions (Defence.in, 2026).

Iran, Israel and Iranian-backed proxies have been trading thousands of rockets, missiles and drones since October 2023 (Israel Policy Forum, 2025). It was indigenously produced or obtained via smuggling networks, and none of this capability was obtained by technology transfers regulated by MTCR. The MTCR's emphasis on supplier-state decisions on export is inadequate to deal with this one-sided aspect of proliferation.

4.10 Structural Gaps: Control List And Institutional Limitations

The MTCR's control system was built to address a previous proliferation issue and is not completely ready for newer missile and unmanned technologies. It fails to consistently cover contemporary dual-use products such as software, production technologies, and space-launch-related systems and equipment. Consensus-driven and heavily dependent on national implementation on the institutional level, the regime is not effectively enforced, reform is slow,

and politically selective interpretation makes it difficult to maintain its credibility (Brockmann et al., 2022).

Any single member state with commercial or geopolitical interest which wishes to block a specific control measure could block the updating of rules for the entire regime (Arms Control Association, 2025b). At the same time, this consensual need is a hurdle to needed reform as well as a buffer against a "slippery slope," where missile technology would be made available to rogue and revisionist states without any consensus limits. The greater issue is the regime's double standard: it is accepting an ally who has an active above threshold missile force, while it is excluding a rival regional state, and reinforcing the notion that MTCR membership is a political privilege for being aligned with the western powers, rather than a technical seal of non proliferation commitment. This two tier system was further entrenched in the January 2025 MTCR reduction by the outgoing U.S. administration that gave agencies the ability to give "increased flexibility for case-by-case review" to certain partner countries (Breaking Defense, 2025).

5. Discussion

Read together, the Iran and India cases illustrate the essential enforcement weakness in the MTCR, which lies at the core. The theory behind the regime was a "supply-side" approach to non-proliferation – a small group of "technologically advanced" states withhold key elements and others will not be able to make long-range missiles. That theory presupposed both that there is no capacity to make a difference on the part of the determined states, and that membership in the regime itself is a sign of restraint. The first is proved wrong by the experience of Iran, the second by that of India. Iran excluded from the regime since its inception developed the most comprehensive and advanced ballistic-missile program in the Middle East by both indigenous efforts and illegal imports via networks that the MTCR was never expected to intercept. India was admitted as the regime's thirty-fifth member with an arsenal of weapons already in place that was above the threshold in 2016, and gave the country the civilian space program as the way to get an ASAT within three years of its accession to MTCR. However, neither in either instance did the central mechanism of the regime, the restriction of exports to the supplier-state, have any real effect on the outcome.

This suggests a more fundamental interpretive dilemma found throughout the literature: is the MTCR a simple technical, non-proliferation tool or is it, in reality, a strategic alignment tool among its most powerful members? The arguments presented in this list support the latter interpretation. The fact that the regime has allowed India to come in when it has a missile program above the threshold but below the outer limit of Category II, and it has not commented on the ISRO-to-HAL technology transfer, even as successive unilateral U.S. reinterpretations of the boundary between the two categories have enabled drone sales to preferred partners, all indicate that the dominant members view the Annex as a tool of policy rather than a technical standard. This reading is strengthened by the persistent exclusion, even with Pakistan having a similar system of export control, and even more so by the fact that Pakistan's export-control system is largely ignored by the other non-members of the Nuclear Suppliers Group, who view the regime as a manifestation of technological monopoly, not a true collective-security accord.

Meanwhile, the failure of the regime is worsening in the midst of a changing nature of war as revealed by the conflict data from 2025–2026. The conventional missile and drone capability that the MTCR was never meant to monitor — unlike WMD-delivery systems, it was designed to police — is now the most important capability in determining the outcomes of the battlefield or regional stability, from Gaza to the Gulf. The hypersonic glide vehicle adds to this issue as it is a technology class that cannot be tracked by either Annex category, and already exists in at least five states, including at least one member of the other, Iran, which deployed it in active combat in 2026.

This diagnosis leads to the reform agenda which follows in this paper. An enforcement gap could be filled by the regime becoming a binding treaty; a gap in legitimacy can be addressed by a non-discriminatory membership; a technical gap can be addressed by closing the loophole for space launch vehicles, and also by including hypersonic systems; and a gap of structural exclusion of the very states whose behavior the regime most needs to address can be addressed by the inclusion of China as a full member, together with a demand-side mechanism. None of these reforms is capable of doing the job alone, but the combination of all of these reforms can address the mechanisms of failure that this paper has identified in both the Iranian and Indian cases.

5.1 Recommendations: Toward A More Effective And Equitable MTCR

Based on the analysis above, the following six recommendations are made for reforming the MTCR and distancing it from its political use.

- Put in place a legally binding regime. Adopting the MTCR as a treaty would set specific obligations, a compliance-verification process and real consequences for failure to comply, as had been done in the Chemical Weapons Convention and the Organization for the Prohibition of Chemical Weapons (SIPRI, 2023).
- Ensure that membership is not based on discrimination. Transparency and objectivity needs to be applied to all states, irrespective of their geopolitical ties with the powers behind the regime, (Eurasia Review, 2023).
- Solve the loophole of space-launch-vehicle. We need an improvement in transparency, compulsory notification of transfer of SLV technology to private firms, and a mechanism for technical review of dual-use SLV technologies, as India is transferring SSLV technology to a defense manufacturer, demonstrating the need for such an overhaul (SAIS Review, 2024).
- Include hypersonic and emerging technologies in the Annex. The Standing Technical Review Committee should be established to review the hypersonic glide vehicles, maneuvering re-entry vehicles, solid propellant precursors and advanced guidance systems to make recommendations for accelerated updates (SIPRI, 2023).
- Engage China as a full member. However, despite its role as a key supplier of missile technology and its commitment to following MTCR guidelines, the exclusion of China is an anomaly and a vulnerability—full membership would carry compliance obligations and transparency requirements and accountability to its peers (Arms Control Association, 2004).
- Deal with the demand for proliferation. A new MTCR must have a way to involve non-member states with their security concerns that motivate their missile program(s), and evaluate if they would be in less need of a missile program if they received security assurances or regional confidence building measures (Kimball & Reif, 2018).

5.2 Limitations

The present study has a few limitations. It uses primarily open source information with many gaps in technology transfers and covert procurement networks that are not fully captured. It covers only a narrow range of cases in the Middle East and South Asia—cases from North Korea and European missile companies are only briefly mentioned—and a larger comparative study might be used to see if the patterns mentioned here apply to other areas and producers. It does not use formal modelling or statistical testing, and its theoretical engagement is realist and institutionalist, with an attention to critical and postcolonial approaches to export-control design only briefly mentioned.

5.3 Significance

This paper is one of the first to examine in the same analytical lens how the MTCR's informal design, undecided exemptions on dual use, and selective use of the treaty interact in both a non-member case (Iran) and a member case (India). It provides a tangible and action-oriented reform agenda for policy makers for the present debate on the export-control architecture ahead of the conflicts of 2025-2026. It sheds light on the strategic importance of shorter-range systems to existing thresholds which understate that importance and to future multilateral discussions on missile and drone proliferation and national defense planning for South Asian and Gulf regional stakeholders.

6. Conclusion

The Missile Technology Control Regime was established in a different strategic world, one in which missile technology was limited to a few industrialized nations, where the threat was the delivery of WMD and where technology denial was an option for non-proliferation. It is no longer that world. Missiles and drones are the hallmark of modern warfare, with states that feel they are facing a security threat repeatedly demonstrating that they can develop missile forces, even in the face of export-control regimes. The most spectacular proof of this is Iran's experience in the 2025 and 2026 wars, firing off successive salvos of precision-guided missiles at a much more powerful enemy after decades of intensive technology denial, and coming out of the war not only alive but with its missile-making capability making a comeback.

India's path is an alternative—and equally dangerous—one: a state that was admitted with an above-threshold arsenal, and was structurally exempt from having to restrict itself from obtaining such capability, achieved anti-satellite weapons capability within three years after accession. The moves outlined in this paper provide a blueprint for a more efficient and fair system — but it is not clear that the political leadership within its main institutions is willing to make the changes. If this does not change, MTCR is likely to remain a non-issue in terms of security threats it was designed to tackle.

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