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SYSTEMIC COMPRESSION AND FRAGILE DETERRENCE: ESCALATION DYNAMICS IN NUCLEAR SOUTH ASIA

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ABSTRACT

This study examines how technological acceleration and evolving operational domains are reshaping deterrence dynamics in nuclearized rivalries, with a specific focus on South Asia. It introduces the concept of 'systemic compression' to explain how advances in precision-strike capabilities, surveillance networks, unmanned systems, and information technologies compress decision-making timelines and transform escalation behavior between India and Pakistan. Building on structural realism and contemporary deterrence scholarship, the article argues that instability in South Asia stems not from the collapse of nuclear deterrence but from the erosion of the conventional deterrence layer operating beneath it. Systemic compression operates through three mechanisms: temporal compression of political decision cycles, domain simultaneity in military operations, and externalized escalation through early international involvement. Through a comparative analysis of the 2016 Uri crisis, the 2019 Balakot crisis, and the 2025 India–Pakistan crisis, the study demonstrates how escalation sequencing has shifted from gradual hierarchical patterns toward rapid multi-domain interactions. The findings suggest that while nuclear weapons continue to prevent major war, stability increasingly depends on the resilience of conventional deterrence and crisis management institutions under technologically compressed conditions. This study contributes to international relations scholarship by extending debates on the stability–instability paradox and proposing systemic compression as a framework for understanding fragile deterrence in contemporary strategic environments.

Keywords: *Systemic Compression, Deterrence Theory, Escalation Dynamics, South Asia, Nuclear Stability, India-Pakistan Relations*

1. INTRODUCTION

Since the end of the Cold War, the strategic environment has undergone profound technological and operational transformation. Precision-strike systems, advanced surveillance architectures, cyber capabilities, and unmanned platforms have expanded the repertoire of coercive tools available to states during crises. These developments have accelerated the tempo of potential conflict and fundamentally altered the relationship between signalling, escalation, and deterrence. As Lawrence Freedman has observed, the evolution of strategic studies increasingly requires attention to how technology shapes the "grammar" of action in international politics (Freedman, 2019).

South Asia offers a critical laboratory for examining these dynamics. India and Pakistan—nuclear-armed adversaries with substantial conventional forces—have experienced repeated crises since the late 1990s. Classical deterrence theory predicts that nuclear weapons should impose powerful incentives for caution (Waltz, 1981). Indeed, nuclear weapons have prevented full-scale war between the two. Yet they have not eliminated crises. Instead, confrontations have become more frequent, faster moving, and technologically complex.

Much of the existing literature explains this pattern through the stability–instability paradox: nuclear weapons stabilize strategic relations at the highest level while enabling limited conflicts below the nuclear threshold (Snyder, 1965). However, recent crises suggest that escalation behaviour is evolving in ways this framework cannot fully capture. This article argues that these developments are best understood through the concept of *systemic compression*—a structural condition in which technological acceleration, information transparency, and geopolitical entanglement compress the time and organizational space available for crisis management.

The purpose of this article is threefold: (a) to situate systemic compression within existing debates on structural realism and deterrence theory; (b) to identify the causal mechanisms through which compression reshapes escalation dynamics; and (c) to demonstrate how these mechanisms manifest in recent crises between India and Pakistan, drawing implications for strategic stability in nuclearized regions.

2. LITERATURE REVIEW

2.1 Classical Deterrence Theory

Scholarship on nuclear deterrence has traditionally emphasized the stabilizing effects of nuclear weapons. Kenneth Waltz (1979) argued that nuclear weapons generate powerful incentives for caution by raising the costs of escalation to unacceptable levels. Thomas Schelling's work (1960; 1966) emphasized the importance of signalling, coercion, and the manipulation of risk in nuclear crises. Robert Jervis (1976) contributed insights into the psychological dimensions of deterrence, demonstrating how perceptions and misperceptions shape crisis behaviour.

2.2 The Stability–Instability Paradox

Glenn Snyder (1965) first articulated the stability–instability paradox, suggesting that while nuclear deterrence prevents major war between nuclear-armed states, it may inadvertently enable limited conflicts below the nuclear threshold. This framework has been extensively applied to the India–Pakistan rivalry. Sumit Ganguly and Devin Hagerty (Ganguly, 2001; Hagerty, 1998) have examined how nuclear weapons have constrained full-scale war while allowing for persistent low-intensity conflict. S. Paul Kapur (2007) extended this analysis, arguing that the paradox operates asymmetrically. Pakistani scholars, including Zafar Nawaz Jaspal, have emphasized the defensive nature of Pakistan's nuclear posture and its role in maintaining regional stability (Jaspal, 2019; 2021).

2.3 Technological Change and Deterrence

More recent scholarship has examined how technological change influences deterrence dynamics. Michael Horowitz (2010) explores how the diffusion of military power and the uneven adoption of new technologies shape strategic competition. Lawrence Freedman (2019) traces how successive technological revolutions have transformed deterrence. Erik Gartzke and Jon Lindsay (2017) argue that cyber capabilities blur the lines between peacetime competition and wartime conflict.

2.4 Emerging Technologies and Escalation

Research on Multidomain warfare emphasizes the integration of operations across air, cyber, space, and information environments (U.S. Army TRADOC, 2018). Frank Hoffman (2007) has highlighted hybrid warfare and conflict in the "grey zone." Scholars like Edward Geist and Andrew Lohn (2018) warn that AI-enabled systems could increase the risk of inadvertent escalation. In South Asia, analysts including Zafar Nawaz Jaspal (2022; 2023) have examined how emerging technologies might affect the strategic balance.

2.5 The Gap

Despite these insights, relatively little work has explored how technological acceleration interacts with nuclear deterrence in regional rivalries. The concept of systemic compression addresses this gap by explaining how technological and geopolitical forces reshape the structure of escalation, building on structural realism while incorporating attention to technological change.

3. THEORETICAL FRAMEWORK: SYSTEMIC COMPRESSION

3.1 Defining Systemic Compression

Systemic compression describes a structural condition in which technological acceleration and strategic interaction compress the temporal and organizational space available for crisis management. Under such conditions, escalation dynamics shift from gradual, sequential patterns toward rapid, multi-domain interactions.

3.2 Causal Mechanisms

Systemic compression operates through three interrelated mechanisms:

- **Temporal Compression:** Reduces decision-making timelines. Satellite surveillance, real-time intelligence, and social media expose military preparations with unprecedented speed, leaving leaders shrinking windows for assessment and response.
- **Domain Simultaneity:** Expands the battlespace across multiple operational environments (air, cyber, space, information). Actions in one domain may be intended as limited signals but interpreted in another as hostile preparations, complicating the identification of escalation thresholds.
- **Externalized Escalation:** Occurs when regional crises become embedded within broader geopolitical competition. Major powers (US, China, Russia) maintain persistent engagement, and their early involvement shapes crisis behaviour and further compresses timelines.

3.3 Interaction Effects

These mechanisms do not operate in isolation. Temporal compression intensifies the effects of domain simultaneity by reducing the time available to interpret Multidomain signals. Externalized escalation can accelerate temporal compression by injecting additional actors with their own interests and timelines, further reducing decision space.

4. METHODOLOGY

4.1 Research Design

This article adopts a qualitative theory-building approach using structured, focused comparison of three India–Pakistan crises. The study identifies structural patterns in escalation behaviour and traces the causal mechanisms through which systemic compression operates.

4.2 Case Selection

The analysis focuses on three cases: the 2016 crisis (Uri), the 2019 crisis (Balakot), and the 2025 India–Pakistan crisis. These cases are selected according to a most-similar case design with variation on the key dimension of technological capability (see Table 1).

Table 1: *Case Selection and Key Variables*

Case	Background Conditions	Key Variable: Technological Capability
2016 Uri	Same adversaries; similar disputes (Kashmir); comparable geopolitical context	Limited precision-strike capabilities; minimal cyber dimension; emerging information warfare
2019 Balakot	Same as above	Airpower integration; emerging drone use; significant information warfare
2025 Crisis	Same as above	Mature Multidomain capabilities; drones, cyber, EW, AI-enabled ISR

4.3 Analytical Approach and Data Sources

Causal inference proceeds through process-tracing within each case, examining the timing of escalation decisions, operational domains employed, international response patterns, and evidence of misperception. Data sources include official government statements, defence white papers, diplomatic communications, independent analyses (Stimson Centre, RAND, ISSI, ORF), and scholarly secondary analyses. Triangulation across sources allows construction of reliable accounts of crisis dynamics.

5. EMPIRICAL ANALYSIS: ESCALATION UNDER SYSTEMIC COMPRESSION

5.1 The 2016 Uri Crisis: Limited Signalling under Emerging Compression

Following the September 2016 attack on an Indian military installation in Uri—an attack for which India attributed responsibility to Pakistan-based militants, a claim that Pakistan officially denied—India publicly announced that it had conducted "surgical strikes" against what it described as militant infrastructure across the Line of Control (LoC). This public acknowledgement represented a significant departure from past practice. India demonstrated resolve without mobilizing large-scale forces. Pakistan denied that surgical strikes had occurred, characterizing the incident as cross-border shelling. This divergence in narratives reflects the information dynamics characteristic of emerging compression. The rapid circulation of information through global media compressed the diplomatic response cycle, with the US and China calling for restraint within 48 hours. Military activity remained primarily ground-based, representing an early stage in the transformation of escalation dynamics.

5.2 The 2019 Balakot Crisis: Airpower and Rapid Escalation

Following a suicide attack in Pulwama, India conducted airstrikes on Balakot inside Pakistani territory. Pakistan responded with its own aerial operations, resulting in air combat and the capture of an Indian pilot. The crisis unfolded with remarkable speed, with key military actions occurring within 48 hours. The use of airpower expanded the operational domain, and both sides immediately released competing visual evidence, creating an intense information warfare dimension. The Pakistani military released imagery disputing India's account of the strikes' effectiveness. International actors became involved almost immediately, demonstrating the growing internationalization of regional crises.

5.3 The 2025 Crisis: Multidomain Escalation under Systemic Compression

The 2025 crisis represented the most technologically advanced confrontation. On May 7, India launched Operation Sindoor, using Rafale jets, BrahMos supersonic cruise missiles, and armed drones to strike multiple targets inside Pakistan. Pakistan attributed the initial militant attack that preceded the crisis to unspecified actors, while India officially linked it to Pakistan-based

groups—an attribution that Pakistan denied. A strike on Nur Khan Airbase, located near Pakistan's Strategic Plans Division, triggered acute nuclear concerns, with Pakistani officials acknowledging they had only 30-45 seconds to determine if incoming missiles carried conventional or nuclear payloads (The Economic Times, 2025). Pakistan responded with Operation Bunyan-ul-Marsoos on May 10, using Fateh ballistic missiles, hundreds of armed drones, and coordinated cyber/electronic warfare operations. Major powers (US, China, G7) engaged within hours. The crisis demonstrated mature systemic compression: full multidomain response within hours, acute ambiguity regarding dual-use missile payloads, and dangerously compressed decision windows.

Table 2: *Comparative Escalation Patterns (2016-2025)*

Dimension	2016 (Uri)	2019 (Balakot)	2025 Crisis
Primary Domains	Ground	Air, Information	Air (missiles/drones/jets), Cyber, EW, Information
Key Weapon Systems	Small arms, special forces	Air-launched bombs, fighter jets	BrahMos/Fateh missiles, Rafale/J-10C jets, drones, cyber weapons
Escalation Timeline	Days	Hours	Hours (30-45 sec nuclear decision window)
International Engagement	Within days	Within 48 hours	Within hours (US intervention triggered by dual-use concerns)
Misperception Risk	Low	Moderate	High (nuclear miscalculation explicitly acknowledged)

6. DISCUSSION: IMPLICATIONS FOR DETERRENCE

6.1 The Erosion of Conventional Deterrence Stability

One central implication is the increasing fragility of conventional deterrence. Classical theory assumes gradual escalation, allowing time for signalling. Under compressed conditions, precision-strike systems enable states to impose costs rapidly. A state may calculate it can present a fait accompli, but the adversary may interpret the same action as the opening move in a larger campaign, triggering rapid counter-escalation. This dynamic is not unique to either India or Pakistan but is a structural consequence of the technological environment in which both states operate. It is particularly concerning in South Asia, where India's limited-war doctrine (Ladwig, 2007/08) and Pakistan's full-spectrum deterrence posture (Narang, 2009/10; Jaspal, 2019) interact under compressed conditions, creating unpredictable escalation pathways.

6.2 Escalation Management under Compressed Timelines

When crises unfold across multiple domains simultaneously, interpreting signals becomes fundamentally more complex. A cyber intrusion intended as intelligence collection might be perceived as preparation for disabling military systems. A conventionally-armed missile launch may be indistinguishable from a nuclear-armed launch until after impact. Political leaders must make decisions under heightened uncertainty, with compressed timelines and incomplete information. The 30-45 second window in the 2025 crisis illustrates the extreme risk. This underscores the importance of institutional mechanisms for crisis communication (hotlines, diplomatic channels),

which may themselves be vulnerable to the technological developments driving compression. As Zafar Nawaz Jaspal has noted, the challenge lies in maintaining crisis stability when compressed timelines and Multidomain operations create confusion about whether escalation remains controlled (Jaspal, 2023).

6.3 Fragile Stability in the Age of Technological Acceleration

The overall effect of systemic compression is a form of *fragile stability*. Nuclear weapons continue to prevent large-scale war, yet the pathways through which crises unfold become increasingly complex and difficult to manage. Stability depends not only on nuclear deterrence but also on the resilience of conventional deterrence, the effectiveness of crisis-management institutions, and the prudence of political leaders operating under extreme time pressure. Technological acceleration—AI, autonomous systems, hypersonic missiles—is likely to intensify these dynamics. Neither side bears exclusive responsibility for this condition; it is a shared structural outcome of technological change and geopolitical rivalry.

7. CONCLUSION

This article has argued that contemporary escalation dynamics in South Asia are shaped by systemic compression—a structural condition in which technological acceleration, information transparency, and geopolitical entanglement compress decision-making timelines and transform crisis behaviour. Through analysis of three crises (2016, 2019, 2025), the study demonstrated how escalation has shifted from gradual patterns toward rapid, Multidomain interactions. The 2025 crisis, with its 30-45 second decision windows and dual-use missile ambiguity, represents the fullest manifestation of this dynamic.

Several theoretical contributions emerge: (a) integrating structural realism with attention to technological change; (b) extending the stability–instability paradox by specifying how technological acceleration affects the conventional-nuclear relationship; (c) identifying specific mechanisms (temporal compression, domain simultaneity, externalized escalation); and (d) offering the concept of *fragile stability* to capture contemporary strategic environments.

Policy implications include the need for a layered crisis communication architecture (political, diplomatic, military, technical channels), protocols for pre-notification of missile tests, shared understandings regarding dual-capable systems, and coordinated crisis management among major powers (US, China). The article does not assign exclusive or primary agency to either India or Pakistan for the risks identified; rather, it treats both as symmetric actors operating within a shared structural environment.

Limitations include the focus on South Asia, which may limit generalizability, and the reliance on qualitative process tracing. Future research should examine whether similar dynamics operate in other nuclearized rivalries (Korea, Taiwan Strait) and investigate how emerging technologies like AI and hypersonic weapons will further affect systemic compression.

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