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An Analysis of India'S Self- Reliance in Technological Growth in National Security with Special Reference to the Operation Sindoor

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Abstract: Independent India has fought several wars against its enemies and has a vast experience of fighting actual and proxy wars. During the previous wars, preceding the "Operation Sindoor", India was dependent strategically on foreign technology. The success stories of India during the preceding wars were written by Indian strategic skill through the arms and ammunitions developed on foreign technologies. The experience of the "Operation Sindoor", launched against Pakistan terrorist outfits, is quite different from the preceding wars and its strategic operation was also unique in many senses. In this operation, Indian forces have written their success story by using and experimenting indigenously developed technology and have registered their strategic supremacy over the enemy forces through precise attacks with calibrated military response. This paper is a humble attempt to highlight India's growing capability of self- reliance in the matter of technology related to the Nation's security.
Keywords-TRF, Operation Sindoor, Calibrated Minitary Response, UAS, ECCM, DFI, IDDM, PLI, Make In India.

Introduction - The Military Character and the strategic significanceof the "Operation Sindoor" is manifrst in the remark of the Prime Minister of India, shri Narendra damdodar das modi, when he spoke in the house of Parliament" In operation "Sindoor",India has not only outperformed Pakistan on the battlefield, but also demonstrated its edge in 21st-century warfare using indigenously developed defence systems. The operation proved India's strength in deserts and mountains and validated the credibility of home-grown weaponry." "Operation Sindoor" was launchedby the Indian defence forces to annihilate the terrorist bases run in and fostered by Pakistan.

On 22 April, Pakistan based terrorist group "The Resistance Front" (TRF) perpetrated a devastating attack in Pahalgam, (India) and killed 26 innocent tourists were killed in cold bloodmanner segregating them on communal basis. TRF,which is an offshoot of terrorist organisation Lashkar-e-Taiba claimed the responsibility for this attack within a few hours. Pakistan's refusal to acknowledge and curb these terrorist networks compelled India to take a responsible and resolute action. Operation SINDOOR emerged as a calibrated military response to an evolving pattern of asymmetric warfare, India's response was deliberate, precise, and calibrated. Without crossing the Line of Control, Indian forces conducted terrorist infrastructure and eliminated multiple terrorist bases. However, beyond tactical brilliance, what stood out determinant was the seamless integration of indigenous hi-tech systems into national defence. Operation SINDOOR marked as a milestone in India's journey towards technological self-reliance in defence capabilities.

Self- reliance in Air Defence Capabilities: On the night of 07-08 May 2025, Pakistan attempted to engage a number of military targets in Northern and Western India. But all Pakistani attempts were neutralized by the Integrated Counter UAS (Unmanned Aerial Systems) Grid and Air Defence systems. On the morning of May 8, the Indian Armed Forces targeted Air Defence Radars and systems at a number of locations in Pakistan. An Air Defence system at Lahore was also neutralised.[1]

In the "Operation Sindoor", the following indigenous defence were used:

(a) Battle-proven AD (Air Defence) systems like the Pechora, OSA-AK and LLAD guns (Low-level air defence guns).

(b) Indigenous developed system such as 'AKASH', (a Short Range Surface to Air Missile system to protect vulnerable areas and vulnerable points from air attacks. The AKASH Weapon System has capability to engage simultaneously multiple Targets in Group Mode or Autonomous Mode. It bears Electronic Counter-Counter Measures (ECCM) features. The entire weapon system has been configured on mobile platforms).[2]

India's Air Defence Systems, combining assets from the Army, Navy, and primarily the Air Force, performed with exceptional synergy. These systems created an impenetrable wall, foiling multiple attempts by Pakistan to retaliate. The Integrated Air Command and Control System (IACCS) of the Indian Air Force enable a coordinated execution of these systems, providing the net-centric operational capability needed vital for modern warfare.

Role of indigenously developed weapon in Offensive Actions with Pinpoint Accuracy: In the "Operation Sindoor" it is the indigenous developed weapons which enable Indian for offensive strikes targeting key Pakistani airbases- Noor Khan and Rahimyar Khan with offensive actions with pinpoint accuracy and surgical precision. Loitering munitions were used to devastating effect, each finding and destroying high-value targets, including enemy radar and missile systems. Loitering munitions also known as "suicide drones" or "kamikaze drones", are weapons systems that can hover andencircle a target area, searching for a suitable target before attacking. All strikes of 'AKASH' were executed without loss of Indian assets. The use of modern indigenous technology, from long-range drones to guided munitions, made these strikes highly effective and tactically calibrated. Indian Air Force bypassed and jammed Pakistan's (Chinese-supplied) air defence systems, completing the mission in just 23 minutes by demonstrating India's technological edge.

Evidence of Neutralized Targets: Operation SINDOOR could produce a concrete evidence of hostile technologies neutralized by Indian systems by using Indian indigenous weapon system. A list of the evidence of neutralised target of the enemy can be given as following.

(a) Pieces of PL-15 missiles (of Chinese origin)
(b) Turkish-origin UAVs, named "Yiha" or "YEEHAW"
(c) Long-range rockets, quadcopters and commercial drones

These were recovered and identified, indicating that despite Pakistan's attempts to exploit through advanced foreign supplied weaponry, India's indigenous air defence and electronic warfare networks remained superior.

Capability of calibrated precise strike through indigenous defence technology: Air Defence systems, Electronic Warfare assets and Air Defence Weapons from both Army and Air Force for precise strikes on terrorists were executed without crossing the Line of Control or International Boundary. It was anticipated that Pakistan's response would come from across the border. Keeping in view the apprehended retaliation on the part of enemy State our defence system used

- A unique blend of Counter Unmanned Aerial and,
- Multiple defensive layers from the International Boundary inwardly to foil enemies

Counter attack. Our defense forces completed the mission by using

a) Counter Unmanned Aerial Systems
b) Shoulder-Fired Weapons
c) Legacy Air Defence Weapons
d) Modern Air Defence Weapon Systems

This multi-tier defence neutralized Pakistan Air Force attacks on our airfields and logistic installations during the night of May 9-10. These systems, built over the last decade with continuous government investment and indigenous technology, proved to be the multiply force mechanism during the operation. They played a crucial role in ensuring that both civilian and military infrastructure inside India remained largely undamaged during enemy retaliatory attempts.

Growth of indigenous defence mechanism and the role of ISRO's and DFI: On May 11, ISRO Chairman V Narayanan mentioned in an event that at least 10 satellites are continuously working round-the-clock for the strategic purpose to ensure the safety and security of the nation.The monitoring of 7,000 km seashore areas and that of theentire northern part is impossible without satellite and drone technology .[3] The Drone Federation India (DFI), is a premier industrial body represented by 550 drone companies and 5500 drone pilots[4] which is vision is to make India a global drone hub by 2030. DFI also hosts several programs like Bharat Drone Mahotsav[5]. Under the supervision of DFI, several companies are active in developing indigenous drone.

Alpha Design Technologies (Bengaluru) which works in partnership with Israel's Elbit Systems builds**SkyStriker**. **Tata Advanced Systems** offers a full range of integrated solutions across Defence & Security and has served as a trusted partner to India's armed forces for over six decades.[6]**ParasDefence& Space Technologies**, which operates within the Defence and Space segments is distinguished by its Indigenously Designed Developed and Manufactured (IDDM) capabilities.[7]**IG Drones** is a also a Drone Technology Company for manufacturing and R & D of Drones specialized in defence and other industry applications along with providing drone related services like drone surveying, mapping & inspection by industry experts. The company has partnered with Indian Army, Besides Government of India, multiple State Governments, and others[8]. The Indian drone market is projected to reach $11 billion by 2030, accounting for 12.2% of the global drone market.[9]

Role of Drones as the central instrument of Modern Warfare: We have witnessed the writing the success story of India indigenously developed drones played determinant role in "Operation Sindoor."The integration of drone warfare into India's military doctrine owes its success to years of domestic R&D and policy reform. Since 2021, the ban on imported drones and the launch of the PLI (Production Linked Incentive) scheme led to catalyze rapid innovation. The scheme of Production Linked Incentive for drones and drone components of Ministry of Civil Aviation was notified on 30th September, 2021 with a total incentive of Rs 120

crores spread over three Financial Years 2021-22 to 2023-24.[10] The future lies in the development of autonomous drones with AI-driven decision-making, and India is already laying the groundwork. Defence exports crossed the record figure of about Rs 24,000 crore in Financial Year 2024-25. The aim is to increase the figure to Rs 50,000 crore by 2029, and make India a developed nation and the world's largest defence exporter by 2047.[11]

Make in India as a move towards self -reliance in defence sector: If India has emerged as a major defence manufacturing hub, its major credit goes to the "Make in India" initiative and a strong push for self-reliance. In FY 2023–24, indigenous defence production reached a record Rs 1.27 lakh crore, while exports soared to Rs 23,622 crore in FY 2024–25, a 34-fold increase from 2013–14. Strategic reforms, private sector involvement, and robust R&D have led to the development of advanced military platforms like the Dhanush Artillery Gun System, Advanced Towed Artillery Gun System (ATAGS), Main Battle Tank (MBT) Arjun, Light Specialist Vehicles, High Mobility Vehicles, Light Combat Aircraft (LCA) Tejas, Advanced Light Helicopter (ALH), Light Utility Helicopter (LUH), Akash Missile System, Weapon Locating Radar, 3D Tactical Control Radar, and Software Defined Radio (SDR), as well as naval assets like destroyers, indigenous aircraft carriers, submarines, frigates, corvettes, fast patrol vessels, fast attack craft, and offshore patrol vessels. The government has backed this growth with record procurement contracts, innovations under iDEX, drives like SRIJAN, and two Defence Industrial Corridors in Uttar Pradesh and Tamil Nadu. Key acquisitions such as LCH (Light Combat Helicopters) Prachand helicopters and the ATAGS (Approval for Advanced Towed Artillery Gun System) highlight the shift towards indigenous capability. With targets of Rs 3 lakh crore in production and Rs 50,000 crore in exports by 2029, India has firmly positioned itself as a self-reliant and globally competitive defence manufacturing power.

Conclusion: Operation SINDOOR is not just a success story of tactical domination rather it is a validation of India's defence indigenization in technology and strategic programming. From air defence systems to drones, from counter-UAS capabilities to net-centric warfare platforms, indigenous technology has delivered its best when it was intended at the most. The fusion of private-sector innovation with, public-sector execution, under the watch of military vision has enabled India not only to defend its people and territory but also assert its role as a hi-tech potential military power in the 21st century. As the world moves to the future conflicts, the battlefield will increasingly be shaped by technology. India, which has demonstrated its technological capability in the Operation SINDOOR, is signaling its readiness to cope with future challenge.

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1. On the night of 07-08 May 2025, Pakistan attempted to engage a number of military targets in Northern and Western India including Awantipura, Srinagar, Jammu, Pathankot, Amritsar, Kapurthala, Jalandhar, Ludhiana, Adampur, Bhatinda, Chandigarh, Nal, Phalodi, Uttarlai, and Bhuj, using drones and missiles.https://www.pib.gov.in/PressReleasePage.aspx?PRID=2127670
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