

Editorial

Air power has become relevant not just for conventional roles assigned to air forces, but as an integral and indispensable part of operations for armies, navies, police forces and border security agencies. The role of air power is undergoing changes in keeping with the march of technologies, particularly in electronics, materials science, sensors, stealth features, payloads, engines and other types of power modules. Air power, manned or unmanned, can play a devastating and effective role in dealing with the panoply of threats and challenges both on and off the battlefield. The ability of versatile air power to guard air space, wage war and deliver ordinance over great distances, often proves crucial to outcomes. Its expeditionary capabilities allow a nation to project both hard and soft power over a much wider geography, in wartime and peacetime, in the face of natural and manmade disasters. Whether during the COVID-19 pandemic or in the aftermath of tsunamis, earthquakes or local wars and conflict situations, the use of air power has proved crucial in extracting Indians and others to safety, delivering food, water and medicines, and in some instances, mounting airborne operations by special forces.

As unmanned aerial vehicles (UAVs) have become ever more diverse and versatile, the definition of what comprises a nation's air power and its potential for employment has changed. Considering that the importance of air power and the utility of various platforms have been proven beyond any doubt, we at the Manohar Parrikar Institute for Defence Studies and Analyses felt that a special issue on Air Power would be an apt and timely contribution to the discourse on the many facets of emerging air power in the 21st century. This special issue titled "Air Power and India: Multi-dimensional Trends" consists of 14 articles and two commentaries.

The first article titled "Exploring Multi-dimensional Trends for the Indian Air Force" by Gp Capt Swaim Prakash Singh explores some critical multi-dimensional trends in air power and how they shape the Indian Air Force's capabilities and approach to defence. The author has

evaluated aspects in the doctrinal, operational, technological and human resource domains with the lessons learned from recent global conflicts and the technological revolution in the air power domain. He highlights significance of *atmanirbharta* and multinational exercises in shaping the trajectory of Indian air power and building strategic partnerships.

In the second article titled “Air Superiority: Myth, Magic or Panacea—Air Power’s Quest for Control of the Air”, Gp Capt Ajay Ahlawat evaluates the crucial contribution of ‘control of the air’ in war and analyses whether it should be considered the primary air power role. He also touches upon the implications on deployment strategies for air power since the nature of warfare is ever-changing. He emphasises that control of air has strong theoretical and doctrinal underpinnings. The lessons from past wars and emergence of new technologies may require applications of new tools; however, the control of air would retain its primacy amongst all other roles of the air power.

This is followed by an article titled “The Need for ‘Inclusiveness’ in the Conceptual Understanding of Air Power: The Indian Case”, in which Mr Rahul Manohar Yelwe and Dr Arun Vishwanathan argue that the current understanding of air power should not be capability-centric and limited to bean-counting of aerial platforms, like fixed-wing or rotary-wing aircraft, but also include the country’s capacity to conduct research and development (R&D) to design and manufacture aircraft and critical components, like engines and sensors, domestically, which would augment India’s overall capacities and capabilities in the aerospace domain with benefits in both civilian and military spheres.

In the present times, the Indian Air Force faces challenges that are unique to the congested and contested geopolitical space of South Asia, with antagonistic nuclear-powered neighbours with near parity in military prowess, hot borders and a multitude of flash points. It is therefore crucial to have a clear understanding of the Centre of Gravity, complexities of planning and the consequent concentration of force to target it. These factors have been covered in detail in the next article titled “Centre of Gravity and The Targeting Conundrum” by Gp Capt Kamran Nazeer.

In the fifth article titled “Sovereignty of Territory and Beyond: A Fresh Perspective”, Gp Capt Pankaj Dhiman emphasises the need to view national security through the contemporary character of war and to look beyond traditional geographical markers to develop a thorough military thinking that is future-oriented. The article attempts to establish and foster a rational

perspective of 'Territory' within the rubric of military instrument of power through the prism of political object (not the objective), strategy, and the character of modern battlefield.

The sixth article "UAVs and Air Power: Role of UAVs in Future Warfare" is by Air Commodore Ashminder Singh Bahal, in which he covers the evolution of the Unmanned Aerial Vehicles (UAVs), their role in peacetime and during conflicts, their strengths and limitations, their relationship with air power including the envisioned role of fighter aircraft in future and the emerging concepts of employing UAVs. He examines China and Pakistan UAV challenge, counter drone technologies, integration of UAVs and synergy in procurement.

This is followed by an article titled "Synergistic Applications of Autonomous UCAVs, Swarm Robotics and Cloud Computing in Future Air Warfare", in which Mr Shaurya Dhakate elaborates how a symbiosis of Autonomous Unmanned Combat Aerial Vehicles (A-UCAVs) with cloud robotics or swarm robotics can help equip military forces with unprecedented agility, resilience and precision, which are essential attributes in the contemporary theatre of conflict. He deliberates on vulnerabilities, advantages and disadvantages of A-UCAVs, challenges of integration of cloud robotics, adoption of A-UCAVs in Indian scenario and conversion of fighters into UCAVs.

India has been a victim of terrorism for decades. Modern advancements in drone technology have added to India's concerns. The eighth article titled "Unmanned Aerial Systems and the Threat of Non-State Actors: Challenges and Prospects for India", by Mr Mukesh Kumar, analyses the growing threat of drone attacks by non-state actors, and draws lessons for India taking into consideration its vulnerabilities and developments in terms of the national response to such attacks.

In the next article titled "Integral Air Support to Land Operations: A Futuristic Perspective", Lt Col Akshat Upadhyay highlights that there is a necessity for land forces to have their integral air support elements in the form of autonomous unmanned aircraft systems, swarms and tactical ballistic missiles in their inventory, taking into account the contested environments they operate in.

Lt Col Prashant Channappa Mural and Dr Rathna GN in their article titled "Game Theory Based Aerial Sensor Deployment and Patrol Planning for Counter-Insurgency Operations", present a conceptual framework for employing game theory, Machine in aerial sensor deployment for counter-

insurgency and counter-terrorism operations, and discuss potential challenges and limitations while also suggesting future research directions.

The eleventh article “Dynamic Maritime Airspace Management: The Philosophy for an AI Environment”, is by Cmde Johnson Odakkal and Mr Neeraj Singh Manhas. The article looks into the evolution of conventional airspace management at sea and the usage of Artificial Intelligence in maritime airspace management from the man-machine interface of detection, identification, designation and action. The article also discusses the importance of developing robust cybersecurity measures and establishing clear policies and procedures to enhance the safety and security of naval assets and personnel.

In the next article, “Maximising Civil–Military Fusion for Indian Airlift Requisition and Beyond”, Mr Armaan Jena explores a dual-use policy to augment Indian airlift capabilities leveraging the civil aviation ecosystem and lays out inputs for consideration and scrutiny. The thirteenth article “Air Power and HADR: Defining the Role of the Indian Air Force in Disaster Management in India”, by Mr Pintu Kumar Mahla, provides an in-depth exploration of the intricate dynamics between air power and HADR, offering valuable insights into the evolving and indispensable role of the Indian Air Force in disaster management in the Indian context.

The last article “Operation Cactus: India’s First Rapid Reaction Strategic Mission in the Neighbourhood” is by Dr Gulbin Sultana, in which she critically analyses Operation Cactus and explores the motive behind the decision of the political leadership in India to respond positively to the Maldivian government’s request for security assistance during the 1988 coup attempt. The article also investigates how the Indian Armed Forces jointly executed the political decision to assist the Maldives. It deliberates on the challenges in execution of operations and suggests measures to overcome them.

This special issue also features two commentaries—“Rethinking ‘Air Power’ for the Governance of Unmanned Aerial Vehicles in India”, by Ms Dnyanada Palkar and Dr Devyani Pande; and “Thorough Analysis of Predictive Maintenance for the Operation and Maintenance of Military Aircraft”, by Mr Om Ranjan.

We hope that the special issue will be received well by our readers. We would like to thank the guest editor, Dr Sanjay Badri-Maharaj, JDS Editorial Committee Member for anchoring this special issue. We would also like to thank the authors and the referees who assisted us in the peer

review process. We would appreciate feedback from our readers about topics they feel should be addressed by the journal. We hope that along with our growing readership, we will also receive an increasing number of contributions for our future issues.

Ambassador Sujan R. Chinoy
Editor, Journal of Defence Studies