AIR POWER

Journal of Air Power and Space Studies

Vol. 17 No. 2 • Summer 2022
(April-June)

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TRANSFORMATION OF INDIAN AEROSPACE POWER: A STRUCTURAL APPRAISAL

DIPTENDU CHOUDHURY

As the Indian Air Force (IAF) approaches 90 years in its steadfast commitment to the security of the nation in October 2022, an appraisal of its long journey is important. Especially so in a country where, despite having a modern, strategic and capable air force with an international credibility regarding its professionalism and demonstrated performance, air power and its capabilities are yet to be fully realised. Exactly 15 years ago, on its 75th anniversary, Air Commodore Jasjit Singh wrote,

> The Indian Air Force is the only military instrument exclusively devoted to military operations in the aerospace continuum for national defence as well as protecting our national interests which are expanding with the growth of the economy and expansion of trade and commercial interests where they can best—or only—be pursued through the aerospace continuum. This is the reason why air forces provide nations with an unsurpassed spectrum of capabilities they may need to pursue in their interests through the military control and exploitation of the third dimension of the aerospace continuum. And the Indian Air Force is no different; hence, it has provided for national defence from, and through, the skies.[1]

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1. Jasjit Singh, *Defence From The Skies* (New Delhi: KW Publishers 2007), pp. xx-xi.

While nations the world over are increasingly investing in, and leveraging, air power, India's continued adherence to the legacy approach of domain- centricity of land and sea power, has led air power to be conspicuously missing in the national strategy and current security narratives. This has narrowed India's security outlook and has 'boxed in' its strategic options.

From the recent debates, discussions and articulated perceptions on defence reorganisation and the proposed restructuring of the armed forces, it is evident that the capabilities and potential of the third dimension are not fully understood by the security establishment and its practitioners. The appreciation has been obscured by the preponderance given to the continental and maritime domains and the exclusive single Service outlook towards national security.

India's security has in the recent years been increasingly dominated by China's coercive foreign policy. The long standing unresolved borders and China's salami slicing tactics have led to standoffs in Arunachal Pradesh and eastern Ladakh, and the points of friction are on the increase, underscoring India's continental challenge. At the same time, China's expansionist and aggressive muscle flexing on its eastern and southern seaboards has spilled over into a larger Indo-Pacific security construct. This indirectly impacts the entire South Asian region, given that the South China Sea is linked to the Indian Ocean Region (IOR) through China's Achilles heel of the Malacca Strait. While the border issue with China is essentially India's problem, the maritime domain geopolitically attracts more attention, given the large number of players involved. The security construct of the continental and maritime domains has historically been seen from 'domain-specific' land and sea perspectives from the First Great War days, when the nascent air power had not yet evolved into the military instrument that it was to become. While nations the world over are increasingly investing in, and leveraging, air power, India's continued adherence to the legacy approach of domain-

centricity of land and sea power, has led air power to be conspicuously missing in the national strategy and current security narratives. This has narrowed India's security outlook and has 'boxed in' its strategic options.

Today, national security is a matter of concern for each and every citizen, and, therefore, is no longer the exclusive preserve of the military instrument, let alone any one Service. The need for a whole of government approach, where the military instrument is but one of the elements of comprehensive national power, does not need reiteration. The interconnectivity and blurred boundaries of the threats and challenges faced by the country today make it imperative to have a comprehensive approach. If anything, the recent regional and geopolitical churning, compounded by international economic downturns, pandemics and climate-change related disasters, have underscored the need to come together and seek multi-dimensional solutions. In this context, three questions emerge: How has Indian air power transformed into aerospace power? Why must all the security stakeholders and, indeed, the nation, understand aerospace power and the spectrum of choices it provides? Why is leveraging the aerospace dimension vital to expand India's security choices and options in the future? This article seeks to address these issues. But to understand the transformation and the future of India's aerospace power, some age-old shibboleths need to be shed.

LETTING GO LEGACY SHIBBOLETHS

Role of Air Power

The IAF is one of the oldest independent air forces, older than the US, German and French Air Forces.[2] It is also the fourth largest after the US, Russia and China. Unlike most of the major air forces which were formed out of the army, the IAF was formed as an independent Service

2. https://en.wikipedia.org/wiki/List_of_air_forces

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due to the precondition which Air Marshal Sir Thomas Elmhirst laid down, when chosen by Prime Minister Jawaharlal Nehru to be the first air chief of independent India. By the time World War II began, the medium of air had become a much-expanded realm of war-fighting, which not only had a major impact on the battles over land and sea, but also gained its individual significance and salience as air warfare. Air power has since served in a variety of roles as an instrument of national power, while evolving and expanding in capability and capacity. From the US concept of global-reach-global-power, China's aggressive use in political signalling and coercion in the East China Sea (ECS) and South China Sea (SCS) region, Israel's strategy of punitive targeting in an urban environment, extensive use in regime change conflicts, to coercive targeting against non-state actors by Russia, Turkey, the Arab countries and Western coalitions, air power has played a major part. Its journey of employment has evolved with changes in technology, the nature of the conflict, the context of its use and, most importantly, it has adapted itself against a wide range of threats and contingencies. Though it certainly cannot win victories entirely on its own, it can produce a variety of outcomes and contribute significantly if used comprehensively with other instruments of power. It has become an integral and inseparable part of the instrument of force in statecraft, and no surface operations, today and especially in the future, can be undertaken without bringing air power into the equation. The offensive capability of air power is its most potent asset, and restraining its employment with either political or military constraints, has proved detrimental to its usage and ability to produce outcomes.

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In the Indian context, the synapse in understanding air power to a great extent has been limited due to two key reasons: a history of tactical air support to the Indian Army in Burma and five wars with a persistent continental threat, has left a somewhat indelible misperception that the air force's primary role is to assist the army in its operations. The other is the post-independence restricted mindset, that the air defence of the Indian air space and sovereignty is the only *raison d'etre* of the IAF. Both these reasons led to the inadequate leveraging of the wide spectrum offensive capabilities air power provides. These two aspects ignore the realities of the way air power has been, and is being, leveraged by all major powers of the world. This, in turn, led to the existing structural challenges rooted in legacy military mindsets, in the understanding and employment of air power in India. Jasjit Singh clarifies, "The issue has not been about the need to provide support to the army and the navy, but about what would be the best way of doing so, exploiting key attributes of aerospace power."[3] That this is best done by the practitioners, is a fact which needs to be understood. The unfortunate issue is that the strategic role that air power plays, enabling it to target strategic assets, infrastructure and resources, deep in the enemy's heartland which is out of the reach of the other Services, has been the unwitting victim of the legacy mindsets. Except for the Indo-Pak War of 1971, the use of air power was fettered in all conflicts, including Kargil in 1999. Given the faded public memory of the 23-year-old Kargil conflict where it played a significant yet constrained tactical role, it is not surprising that the appreciation of the IAF's role is equally constrained in the minds of the citizens and the military fraternity.

3. Singh, n. 1, p. 222.

The technology driven development of air power in just over a century of its origin has long transformed into the broader 'aerospace' power. The term was introduced by the US Air Chief General White way back in 1958 and almost immediately was included in the US Air Force (USAF) doctrine.

Aerospace Power Conundrum

The technology driven development of air power in just over a century of its origin has long transformed it into the broader 'aerospace' power. The term was introduced by the US Air Chief General White way back in 1958 and almost immediately was included in the US Air Force (USAF) doctrine. However, while the USAF itself was divided on the term 'aerospace', "the idea behind it underwent a forceful resurgence during the second half of the 1990s, as the Air Force leadership declared that the service had become an 'air and space force'".[4] Colin Gray argued, "Space is as geophysically, and, hence, technologically, tactically, and operationally, distinctive from the air as it is from the land and the sea."[5] Despite the opposing schools which disagreed with the concept on the premise that the two were separate mediums, or that it was a ploy by the air force to make space its exclusive domain, in 1996, USAF Chief General Ryan articulated that "air and space are a continuum—forever … [and that] requires a clear realization that there is no delineation, break, or boundary in the third dimension. There is space in air and air in space; it's just that the molecules further out are a long way apart…. We can have no fire-support coordination line in the vertical dimension."[6] He was responsible for setting up an 'Aerospace Integration Task Force (AITF)' comprising the US Air Force's "best aerospace thinkers" to work toward building "a single, consolidated plan that will provide

4. Benjamin S. Lambeth, "Air and Space Versus 'Aerospace,'" in *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space* (RAND Corporation, 2003), pp. 37-38. http://www.jstor.org/stable/10.7249/mr1649af.9. Accessed on January 5, 2022.
5. Colin S. Gray, *Explorations in Strategy* (Westport, Connecticut: Praeger Publishers, 1996), pp. 64-65.
6. Lambeth, n. 4, p. 39, citing General Michael E. Ryan, USAF, speech to the Air Force Association national symposium, Los Angeles, November 14, 1997.

continued integration of air and space power and orderly migration to future capabilities which best exploit the seamless aerospace dimension."[7]

The debate over the terms 'air and space' and 'aerospace' is whether to accept the mediums of air and space separately or as one. The key argument for differentiating the two mediums is that aircraft are governed by the laws of aerodynamics, while space assets are governed by space laws and orbital mechanics. The internationally accepted notional separation between air space and space is the Karman Line, which extends till 62 miles (100 km) above the Earth's surface, and divides aeronautics from astronautics. Both are separate fields, but are dependent in opposite ways on the Earth's atmosphere—astronautics needs the lack of atmosphere to be viable; aeronautics needs the presence of atmosphere.[8] Those in favour of a common aerospace medium base their argument on the fact that due to the seamless continuum of air and space, *"platforms will perform similar missions and the characteristics of air and space assets will merge as systems that can operate in both environments."*[9] Despite the contrarian views of some like Lambeth and Gray, Jasjit Singh makes three irrefutable points: with no dividing line between air and space, it is indeed a continuum of the third dimension above the Earth's surface; the growing economy, trade expansion and commercial interests will necessitate the pursuance of the aerospace continuum in our national interest; military operations of the future will increasingly use this continuum for furthering

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7. Ibid., pp. 2-3.
8. "100 KM Boundary for Astronautics, FAI Astronautic Records Commission", https://www.fai.org/page/icare-boundary. Accessed on January 9, 2022.
9. Major Carl Banner, "Defining Aerospace," https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Chronicles/baner.pdf. Accessed on January 9, 2022.

national security. The terms aerospace power and air power are often used interchangeably, with the understanding that air power capabilities and exploitation today extend up to 'near space'. While this commonly used term does not have a classic definition, it refers to the Earth's atmosphere up to 100 km, which delineates near space from outer space by the imaginary 'Karman Line'. Thus, Indian air power with its vast array of ever increasing space dependent operations and applications, like intelligence, surveillance, reconnaissance, navigation, imagery, targeting, meteorology, communications, operational networks, cyber, command and control, etc., is justifiably an aerospace power.

Tactical vs Strategic Air Power

Despite the contrarian views of some, the IAF today is undoubtedly a strategic air power. Is this transformation merely because of the multiplicity of its roles and wide array of kinetic and non-kinetic capabilities which have certainly expanded the tactical and operational levels of its employment? The real transformation has actually more to do with the strategic outcomes that air power has proved time and again it can create, and it is this strategic capability which needs greater examination. Colin Gray argues that air power's strategic story has not been developed and explained soundly and persuasively. He goes on to say, "The true irony in air power history is that aviation has been seriously undersold as a consequence of its being oversold."[10] In India's case, it remains undersold due to inadequate articulation by the IAF, the surface-centric focus of the politico-bureaucratic-military leadership, practically nil representation of senior air force practitioners in the national security establishment, an 'air-blindness' amongst the surface-centric strategic community, and the negligible discourse, debate and discussion on air power amongst the academia and media.

What makes air power distinctly stand apart is the speed with which it responds, its reach which is not limited by the obstacles or spaces in the

10. Gray, n. 5.

continental or maritime realms, and the calibrated effects it produces, ranging from the tactical to the strategic. Two years ago when Indian fighter aircraft entered the Pakistani air space and struck the terror training camp at Jabba Top in Balakot, the IAF crossed the Rubicon of new age air power. For the first time, a border was crossed in peace-time to carry out a kinetic air strike, not for a military objective but a political one. With this one air strike, India joined an exclusive club of very few select countries which have used air power as a strategic instrument of national power for achieving a national objective. It was an unabashed hard power show of capability and intent, well inside the sovereign territory of a nuclear armed adversary, kept under the conflict escalation thresholds, in peace-time. To a great extent, it is also the IAF's preoccupation in the past with 'practice and use' of air power, and inadequate focus on the 'aim and effect' of its use, coupled with an understated approach regarding its contributions, that has kept its thinking tactical and limited to support of surface forces, rather than as a strategic force of the nation.[11] Over the last decade, the IAF has not only addressed this shortcoming by reorienting its doctrinal outlook as a strategic air power, it has also reviewed and reorganised its operational and peace-time roles from a strategic perspective. According to Goulter and Pant, in the 2012 version of Doctrine of the Indian Air Force, "*air power is viewed as an indicator of national power*" and is defined as comprising the *"sum total of a nation's aviation and related capabilities, including civilian assets"*. And that it is *"perhaps the most unique conceptual work that is displayed in the areas of control of air and strategic effect"*. The doctrine articulates the direct connect between air power and national strategy, wherein it is identified as "an indicator of national power in order to serve India's national interest not only across

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11. Singh, n. 1, p. xx.

Strategic air power capability is different from the tactical in that it can prosecute air operations over large distances across continental and maritime spaces, and not limited to only kinetic or hard power applications.

the full spectrum of conflict, but nation building and military diplomacy as well."[12]

Strategic air power capability is different from the tactical in that it can prosecute air operations over large distances across continental and maritime spaces, and not limited to only kinetic or hard power applications. It has come to be extensively employed for non-kinetic or soft power applications as well. It is time that the IAF's air power capabilities are no longer underestimated and hyphenated to a limited tactical role of supporting the surface forces in a war-fighting construct. Even with its present reduced force levels, the significant spectrum of kinetic and non-kinetic capabilities, the trans-continental reach of its combat aircraft and enablers, and, most importantly, the amply demonstrated performance of both hard and soft power areas in the recent years, the IAF has quietly transformed from a tactical air power to a strategic one. The caveat, however, is that while it already possesses significant strategic capability, it needs to expand its strategic capacity. This is an ongoing process, and in the absence of any defined goal posts of 'how much' constitutes 'adequate' strategic capacity. It is time to exploit and leverage our ample present strategic capabilities of air power for strategic national security and interests in the current geopolitical milieu in the region. Capacity will follow.

Way back in 2004, the PLA Air Force (PLAAF) had expanded its air defence-centric doctrinal outlook to include the offensive capability of air power. It adopted a Service specific strategic concept wherein it

12. Christina Goulter and Harsh V. Pant, "Realignment and Indian Air Power Doctrine", *Journal of Indo-Pacific Affairs*, vol. 1, no. 1, fall 2018, pp. 26-27. Published by Air University, on January 2, 2020. https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2007488/realignment-and-indian-airpower-doctrine/. Accessed on January 9, 2022.

integrated air and space operations, to simultaneously develop and prepare both offensive and defensive capabilities. This new concept of the PLAAF as a strategic air force was endorsed by the Chinese leadership and articulated by the Chinese state media.[13] Eight years ago, in 2014, Chinese President Xi Jinping during his visit to the PLAAF headquarters, emphasised the need to "accelerate construction of a powerful people's air force that integrates air and space" and described the PLAAF as a "strategic Service, one that is capable of playing a decisive role in the overall situation of national security and military strategy".[14] The Chinese leadership has long understood the strategic role of the PLAAF and has been prescient to integrate it as a significant instrument of its coercive strategy, not only to protect its economic lifelines of trade and energy, but its sovereignty and geopolitical interests as well. An analysis of the PLAAF's expanding mission sets and roles, points to its elevation into a strategic instrument of China's revisionist foreign policy and national security strategies.[15] Ironically,

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13. Michael S. Chase and Cristina Garafola, "China's Search for a Strategic Air Force," *China Brief*, vol. 15, issue 19. http://jamestown.org/program/chinas-search-for-a-strategic-air-force. Accessed on January 9, 2022.
14. Zhang Yuqing and Li Xuanliang , "Xi Jinping Inspects the PLA Air Force Organs, Stresses More Quickly Building a Powerful People's Air Force Characterized by Air and Space Integration, Both Offense and Defensive Capabilities So as to Provide Strong Force Support for the Fulfilment of the Chinese Dream and the Strong Army Dream", Xinhua, April 14, 2014. Cited by Edmund J. Burke, Astrid Stuth Cevallos, Mark R. Cozad, Timothy R. Heath, *Assessing the Training and Operational Proficiency of China's Aerospace Forces* (Santa Monica, Calif.: RAND Corporation, 2016). https://www.rand.org/pubs/conf_proceedings/CF340.html. Accessed on January 10, 2022.
15. Diptendu Choudhury, "Expanding Role of PLAAF in China's National Security Strategy", *Strategic Analysis*, 44: 6, 2020, pp. 529-531.

The IAF, despite having produced strategic outcomes in the past, has been inadequately appreciated by the security establishment as a strategic instrument.

the IAF, despite having produced strategic outcomes in the past, has been inadequately appreciated by the security establishment as a strategic instrument. From a geopolitical foreign policy perspective, in view of the IAF's peace-time strategic contributions, from the Maldives airlift to the Balakot strike, its international contributions in humanitarian assistance and disaster relief, the swift response to the COVID-19 pandemic in providing aid to the region, and enabling 1,154 lakh vaccine doses to be distributed to 97 countries as a part of the government's 'Vaccine Maitri' initiative,[16] it is high time that the IAF is embraced as a strategic force.

THE TRANSFORMATIONAL JOURNEY

Five core characteristics, which individually or combined, provide air power its distinct capabilities, have been redefined due to the immense technological transformation over the years. The near continuous technological and doctrinal transformations which the IAF has undergone over the years, provide a vast spectrum of options to be leveraged in the national interest. These are:

Reach: The range of a combat aircraft dictates its combat reach, or the maximum depth to which it can travel to engage targets. Again, it is the ubiquity of the air medium and its continuum with space that allows unfettered employment of air power and permits it "unparalleled reach, and if exploited correctly, will provide a tremendous advantage to the side exploiting it".[17] The World War I British fighter SE 5, which was flown by Indra Lal Roy, the only fighter ace of Indian origin with nine 'kills', had a maximum range of 480 km. The longest non-stop operational photo-reconnaissance

16. As per the COVID-19 vaccine supply status of December 31, 2021, of the Ministry of External Affairs (MEA), https://mea.gov.in/vaccine-supply.htm. Accessed on January 10, 2022.
17. "Basic Doctrine of the Indian Air Force". https://fdocuments.in/document/basic-doctrine-of-indian-air-force-2012pdf.html, p. 20. Accessed on January 3, 2022.

mission of World War II was by a USAF B 29 bomber, which covered a distance of 7,483 km and took 23 hours to complete.[18] Today, super cruise ability combined with aerial refuelling enables "unparalleled strategic reach which provides the opportunity to observe and influence operations in the maritime and land environments, regardless of their location".[19]

Air power is versatile because the same platforms, whether fighters, transports, helicopters or Remotely Piloted Aircraft (RPA) can be used in both peace and war in a wide variety of kinetic and non-kinetic applications.

Flexibility: The words flexibility, versatility, agility, adaptability, etc., all highlight the ability to exploit all constituents of combat air power in whatever way necessary, tailored to the situation. Air power is versatile because the same platforms, whether fighters, transports, helicopters or Remotely Piloted Aircraft (RPA) can be used in both peace and war in a wide variety of kinetic and non-kinetic applications. Fighters like the SU-30 and Rafales are used for air defence of a nation's sovereign air space and island territories, for protecting national interests in the maritime domain, delivery of weapons into enemy territory, and for intelligence gathering and reconnaissance. Transports and helicopters are interchangeably used for air logistics, humanitarian assistance and disaster relief, casualty evacuation, Search and Rescue (SAR), weapon delivery, etc. RPAs carry out Intelligence Surveillance, Reconnaissance (ISR), target designation, lasing and weapon delivery. Air power's agility arises from its ability to exploit its core characteristics to react and respond swiftly to all kinds of operational and peace-time situations and requirements. It can uniquely operate in the strategic, operational and tactical realms individually, as well as simultaneously in all three realms 'in parallel'. Its agility permits it to switch between realms, theatres or areas of operations seamlessly. Its adaptability allows calibrated employment to

18. Charles A. Jones, "The Longest Mission", *Air Force Magazine*, April 1, 2010. https://www.airforcemag.com/article/0410mission/. Accessed on January 3, 2022.
19. "UK Air and Space Power, Joint Doctrine", Publication 0-30 (JDP 0-30) (2nd Edition), dated December 2017, Ministry of Defence, p. 26.

The swift mobilisation undertaken in the Kashmir airlift, where the Himalayan terrain and the distance were limiting factors in moving the troops by road in time, is a classic example of mobility.

match the effects, desired outcomes and escalation levels in conflicts and war. In peace, it can adapt from kinetic political signalling like in Balakot, to the long-range IAF missions to the Malacca Strait in a show of reach and capability.[20]

Mobility: A combination of elevation, speed and reach allows air power to mobilise swiftly in peace-time for a variety of contingencies, and provide a wide array of applications towards joint objectives in war. The freedom of movement across domains enables aircraft to be employed above land and sea, and across the boundaries between them, while the movement and range of surface forces are limited by terrain and domain boundaries. The swift mobilisation undertaken in the Kashmir airlift, where the Himalayan terrain and the distance were limiting factors in moving the troops by road in time, is a classic example of mobility. Similarly, during the 1971 Indo-Pak War, to bypass the Ashuganj bridge held by the Pakistani forces, the IAF helicopters air-lifted the entire 311 Brigade across the Meghna river at night. Extensive inter-valley troop transfer of acclimatised forces across the mountainous Himalayan terrain, which saves invaluable time in reinforcement and redeployment, underscored the mobility of the IAF in Ex-Gaganshakti.[21] The heavy lift and long range capability of platforms like the C-17, IL-76 and the versatile C-130 transport aircraft provide intra and inter-continental mobility to meet security, humanitarian and other contingencies in the national interest.

Responsiveness: The capabilities of flexibility and mobility translate into responsiveness, which is fundamentally the ability to react swiftly. The IAP 2000-12 explains, "In a crisis, the use of air power will normally be the option most readily available and usable by the government. Air power

20. Air Marshal Anil Chopra, "Exercise Gagan Shakti 2018—Comprehensive Test of Air Power", *USI Journal*, April-June 2018. https://usiofindia.org/publication/usi-journal/exercise-gagan-shakti-2018-comprehensive-test-of-air-power/. Accessed on January 3, 2022.
21. Ibid.

can be used to demonstrate national resolve quickly by deployment, or heightened states of readiness, and it is the most readily available means for demonstrating combat power. Air forces can also be used to establish and maintain a military presence as an extension of diplomacy".[22] That the IAF is today the first responder in almost all conflict situations and peace-time contingencies as well, is a fact established by its track record. All IAF combat resources, both defensive and offensive, spin up to highest alert state and operational readiness within hours in any contingency. Very few realise that designated radars, fighters, surface-to-air guided systems and combat crew are on a 24×7 operational alert, 365 days, year on year, to respond to any air threat. The IAF has carried out innumerable number of peace-time Air Defence (AD) response 'scrambles' to intercept sovereign air space violations by enemy aircraft operating close to the border, airliners straying from their pre-determined and cleared routes, and even balloons which have drifted across the border due to the winds. Aside from this, the reduced reaction timelines enable the IAF to swiftly respond to natural disasters and crises within the country and internationally.

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Offensive Lethality: The IAF Doctrine lists shock effect, concentration of force and offensive action as independent air power capabilities. However, their blurred distinction and close interdependence, possibly makes 'offensive lethality' a more comprehensive capability. Again, the speed and response of air power combined with surprise, can create shock effect, which can "*induce confusion and psychological disorientation*".[23] One can imagine the shock effects and concentration of six tonnes of iron bombs (unguided) dropped on an adversary by one SU-30 with an accuracy of a few metres. The effects would double or quadruple if a formation of two or four aircraft attacked a target. Precision targeting ability of weapons like the Spice 2000

22. n. 11, p. 19.
23. Ibid., p. 19.

Use of Predator drones remotely controlled from thousands of miles away by the US to hit terrorist targets accurately in Afghanistan, Pakistan, Yemen, etc. has brought in kinetic air power application in the absence of war into the limelight.

which can take out specific targets with minimal or no collateral damage,[24] and the standoff targeting capability of the Bramhos missile, capable of cruising at Mach 2.8 and launched from a distance of 400 km away, provide air power a variety of offensive options which cannot be matched by surface-launched weapons. Concentration of air-delivered firepower today assumes great significance due to precise accuracy and limiting the collateral damage to the intended target only. Use of Predator drones remotely controlled from thousands of miles away by the US to hit terrorist targets accurately in Afghanistan, Pakistan, Yemen, etc. has brought in kinetic air power application in the absence of war into the limelight.

SALIENCE OF THE THIRD DIMENSION

The instinctive exclusion of the vertical third dimension of the air space medium from a security perspective, is more often than not, due to its not being a visible and definable physical geographical domain. This is a common misperception because air has distinct physical characteristics of volume, weight and density. The sovereign boundaries of a nation are not just limited to land and sea, but include air as well. Sovereign air space is very much a clearly defined, demarcated and internationally accepted domain. In fact, the provisions of the United Nations Convention on the Law of the Sea (UNCLOS) "also affect air space and the operation of aircraft". The UNCLOS clearly defines "volumes of air space that are sovereign and international".[25]

24. Dev Goswami, "SPICE-2000: Know all about the Smart Bomb Indian Air Force Used for Balakot Airstrike", *India Today*, March 5, 2019. https://www.indiatoday.in/fyi/story/spice-2000-indian-air-force-balakot-airstrike-mirage-jets-1470988-2019-03-05. Accessed on January 5, 2022.
25. "International Airspace and Civil/Military Cooperation". https://www.icao.int/APAC/Documents/edocs/International%20Airspace%20and%20Civil-Military%20Cooperation.pdf, Accessed on January 9, 2022.

"A basic principle of international air law is that every state has complete and exclusive sovereignty over the *air space* above its territory, including its territorial sea."[26]

Air law applies to air space and aircraft. States enjoy "*complete and exclusive sovereignty*" over their territorial air space. The Convention on International Civil Aviation (also known as the Chicago Convention) states, "Every state has complete and exclusive sovereignty in the air space above its territory", and, "Territory includes the land areas and territorial waters adjacent thereto".[27] Unlike land border issues which have physical occupation challenges, air space borders, like maritime borders, are equally subject to violations. Territorial air space violations have serious implications on not only sovereignty, but also security due to multi-spectral adversarial intelligence gathering, surveillance and reconnaissance, covert aerial insertion of spies, agent provocateurs, terrorists, arms and drug droppings, etc. The use of drones on India's western border areas for drugs, weapons and fake currencies is just the tip of the iceberg.

The use of drones on India's western border areas for drugs, weapons and fake currencies is just the tip of the iceberg. The spectrum of threats emerging out of the third dimension today have a wide range. At the lower end are the low speed, low altitude and low radar cross-section threats

The spectrum of threats emerging out of the third dimension today have a wide range. At the lower end are the low speed, low altitude and low radar cross-section threats like hang gliders, parasails, paragliders, microlights, remotely piloted aero models, mini and micro drones, swarms, etc. At the mid-range are fighters, unmanned combat aerial vehicles, a wide variety of air-launched weapons including long range standoff munitions, cruise missiles, stealth platforms and surface-to-surface missiles. These

26. "Definition of Airspace Sovereignty". https://www.britannica.com/topic/air-law. Accessed on January 9, 2022.
27. Louis de Gouyon Matignon, "The Delimitation between Airspace and Outer Space", July 23, 2019. https://www.spacelegalissues.com/the-delimitation-between-airspace-and-outer-space/. Accessed on January 9, 2022.

range from low to supersonic speeds, use a wide range of altitudes and have varying radar cross-sections. And, finally, at the high end of the spectrum are the intercontinental ballistic missiles, reentry vehicles, hypersonic platforms and weapons, directed energy weapons, and an increasing variety of future threats which have already begun to make their presence felt. This widens the spectrum of air defence from endo-atmospheric systems ranging from multi-spectral sensors, close-in weapon systems and long range area defence missile systems, to exo-atmospheric anti-missile defence systems and strategic missile defence systems. The air space domain is also inhabited by sensor grids, shooter grids and command-control grids with ever increasing density. And this is only the military usage of the third dimension. Add to it the commercial and non-military exploitation of the third dimension, its salience increases multi-fold. According to the India Brand Equity Foundation assessments of October 2021, "The civil aviation industry in India has emerged as one of the fastest growing industries in the country during the last three years. India has become the third largest domestic aviation market in the world and is expected to overtake the UK to become the third largest air passenger market by 2024. India is expected to overtake China and the United States as the world's third-largest air passenger market in the next ten years, by 2030, according to the International Air Transport Association (IATA)."[28] The report assesses that "India's aviation industry is expected to witness US$ 4.99 billion investment in the next four years. The Indian Government is planning to invest US$ 1.83 billion for development of airport infrastructure along with aviation navigation services by 2026".[29]

From a security perspective, the most important aspect of the third dimension is the dominance asymmetry provided by the permanent ownership or temporary control of air space above land and sea territories. Just the Chinese declaration of an Air Defence Identification Zone (ADIZ) in 2013 due to the disputed ownership between China and Japan and Taiwan

28. Indian Aviation Industry, Report of the Indian Brand Equity Foundation, October, 2021. https://www.ibef.org/industry/indian-aviation.aspx. Accessed on January 9, 2022.
29. Ibid.

over the island territories caused an "international furore".[30] Imagine the disruption to civil aviation that would occur if the ADIZ had been enforced. The air space closure by Pakistan between February and late June in 2019 in the aftermath of the Balakot air strike by India, affected nearly 400 flights a day and a loss of nearly $100 million for Islamabad. The closure led to increase in flight durations as international flights had to circumvent the Pakistani air space, resulting in increased fuel, operational and maintenance costs, and longer aircrew duty hours.[31] The Chinese ADIZ declaration, Anti-Access/Area-Denial (AA/AD) strategy of forward deployment of long range area defence surface-to-air guided weapons, creation of fighter capable airfields on artificial islands, and increasingly aggressive air space domination fighter and bomber aircraft missions regularly over Taiwan, and the East and South China Seas, all have huge ramifications. It is a classic example of Giulio Douhet's premise[32]: the country controlling the air would control the surface.

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AIR POWER: THE FUTURE INDIAN CONTEXT

While commenting on the future role of the Chinese PLA Air Force (PLAAF), General Ding Laihang, the previous PLAAF chief, stated on China National Radio: "In the past, our strategies and guidelines focused on territorial air defence. Now we have been shifting our attention to honing

30. Mark Stokes, "China's Air Defense Identification System: The Role of PLA Air Surveillance". https://project2049.net/wpcontent/uploads/2018/06/Stokes_China_Air_Defense_Identification_System_PLA_Air_Surveillance.pdf. Accessed on January 5, 2022.
31. "Pakistani Air Space Closure after the Balakot Strike Cost Islamabad Rs 688 Crore", *Business Today*.in, July 3, 2019. https://www.businesstoday.in/latest/world/story/pakistani-airspace-closure-after-balakot-strike-cost-islamabad-rs-688-211969-2019-07-03. Accessed on January 9, 2022.
32. Giulio Douhet, *The Command of The Air*, Translated by Dino Ferrari, New Imprint Air Force History and Museum Program, 1998, pp. 22-23. https://www.airuniversity.af.edu/Portals/10/AUPress/Books/B_0160_DOUHET_THE_COMMAND_OF_THE_AIR.PDF. Accessed on January 10, 2022.

The PLAAF has joined the PLA Navy (PLAN) as an equal instrument of coercion in the East and South China Seas.

our ability in terms of long-range strategic projection and long-range strike."[33] Consequently, the PLAAF has joined the PLA Navy (PLAN) as an equal instrument of coercion in the East and South China Seas. The current Chief, General Chang Dingqiu, is known for placing fighting and winning wars above politics and his bold approach to flight training, which challenged certain existing norms, reflects the new-found confidence within the PLAAF.[34] Its rapid advancements prompted the USAF Chief of Staff General Mark Welsh, to caution the House Appropriations Committee in 2016, that "China's aircraft numbers would be as big if not bigger than the US' by 2030".[35] The strategic underpinnings of the significant role of Chinese air power in the contested maritime domain of the South and East China Seas are evident to all the stakeholders in the region, especially the US. Therefore, it is no coincidence that in the last SCS crisis, two Carrier Strike Groups (CSGs) of the US Navy, one flat-top from its home port in Japan and the other from the Philippines, exercised southeast of Hainan Islands. With two CSGs, each with 65-70 combat aircraft, supplemented by the USAF's B-52 nuclear-capable Stratofortress bombers from its task force in mainland US, it was essentially a display of coercive air power aimed to deter the Chinese belligerence. While Taiwan holds out against the 'one-China' policy of its neighbour, only two factors help it to buy time—its small but well trained and equipped modern air force, and the US support.[36] The US sale of 66 latest F-16 V to bolster the Taiwanese Republic of China's Air Force

33. Quote by General Ding Laihang, *ASEAN Weekly*, September 11, 2017. https://www.chinadailyasia.com/asean-weekly/article-13382.html. Accessed on January 2, 2022.
34. Marcus Clay and Rod Lee, "Star General Chang Dingqiu Takes Command of China's Air Force", *The Diplomat*, September 21, 2021. https://thediplomat.com/2021/09/star-general-chang-dingqiu-takes-command-of-chinas-air-force/. Accessed on January 10, 2022.
35. https://www.wearethemighty.com/articles/chinas-airpower-may-overtake-the-us-air-force-by-2030. Accessed on January 10, 2022.
36. Air Marshal D Choudhury, "Absence of Air Power from India's Security Narrative". https://www.vifindia.org/article/2021/june/16/the-absence-of-air-power-in-india-s-security-narratives. Accessed on January 2, 2022.

(ROCAF),[37] that will take its combat inventory to more than 200 F-16 jets, the largest in the region, highlights the criticality of air power in its national security matrix.[38]

China's sophisticated leveraging of its air power's coercive capabilities in the national security context, is not only restricted to its eastern and southern seaboards, but expanding outwards towards the second island chain.

China's sophisticated leveraging of its air power's coercive capabilities in the national security context, is not only restricted to its eastern and southern seaboards, but expanding outwards towards the second island chain. It is regularly undertaking complex long range simulated standoff strike missions with air-to-air refuellers, airborne early warning aircraft and SU-30 air superiority fighters. "The PLAAF now also sends bombers routinely to threaten Japan, Guam, and other Association of Southeast Asian Nations (ASEAN) allies. The PLAAF's long-range mission capability significantly expands the variety of its roles, including long-range strikes and air superiority missions. It also displays the ability of land-based air power to compensate for China's presently limited carrier capability."[39] China, therefore, "recognises the asymmetric air power advantage India currently enjoys in the Tibet Autonomous Region. To close the gap, it is rapidly expanding infrastructure and assets, deploying its latest aviation hardware in its bases in the region, increasing its air combat training, conducting international exercises"[40] including the dedicated Shaheen series with Pakistan[41]. China not only looks at Pakistan as a conduit for imbibing Western air combat tactics, it also understands

37. "State Department Approves Possible $8 Billion Fighter Jet Sale to Taiwan: Pentagon", August 21, 2019. https://www.reuters.com/article/us-usa-taiwan-aircraft-idUSKCN1VA29F. Accessed on, January 2, 2021.
38. Choudhury, n. 36.
39. Diptendu Choudhury, "Expanding Role of PLAAF in China's National Security Strategy", *Strategic Analysis*, vol. 44, no. 6, November-December 2020, p. 534.
40. Choudhury, n. 36.
41. "Pak-China Air Exercise Shaheen IX Underway", *The News*, December 11, 2020, https://www.thenews.com.pk/print/756852-pak-china-air-exercise-shaheen-ix-underway. Accessed on January 1, 2022.

China not only looks at Pakistan as a conduit for imbibing Western air combat tactics, it also understands the potential of leveraging the PAF's inventory and operational experience collusively against the IAF's current asymmetric advantage in the TAR.

the potential of leveraging the PAF's inventory and operational experience collusively against the IAF's current asymmetric advantage in the TAR. Consequently, the Vice Chairman of China's Central Military Commission General Xu Qiliang, and Xi Jinping's right hand man, inaugurated the Centre for Artificial Intelligence and Computing (CAIC) at the PAF HQ in Islamabad, in August 2020. According to the PAF chief, "Technology had altered the characteristics of warfare in the 21st century and the vision of establishing the centre was to harness the potential of artificial intelligence and its integration in the PAF's operational domain."[42] Xu is said to have succeeded in impressing upon Pakistan the significance of making the PAF the lead Service in the war, and that the PLA was ready to share select virtual war domains capabilities with the PAF for war in the north Kashmir and Ladakh region.[43] So, how critical is air power in Ladakh? Let us theoretically take the IAF out of the equation in Ladakh/ Tibet. Will it allow the PLA the option to get more coercive in its actions? Will it allow the PLA to now exploit the asymmetric advantage of using the PLAAF to enhance its coercive advantage? Will it enhance China's coercive deterrence to inhibit the IAF to a totally defensive holding posture? If the answers are yes, then it is time to include air power as a national instrument in all our continental response strategies. To even remotely consider any continental contingency without offensive air power in the region will be a 1962 redux, a strategic mistake for the nation, and not just a local tactical one.

42. "PAF Opens Artificial Intelligence Computing Center", August 28, 2020. https://www.dawn.com/news/1576836. Accessed on January 4, 2022.
43. Pravin Sawhney, "The Chinese Military Threat is not a 'Border Dispute', It's Time India's Leaders Realised This". https://thewire.in/security/the-chinese-military-threat-is-not-a-border-dispute-its-time-indias-leaders-realised-this. Accessed on January 4, 2022.

In the maritime domain, "the IOR is India's vital lifeline for energy, trade and commerce, and, therefore, its security is imperative for India's growth and future."[44] Prime Minister Modi in his keynote address at the Shangri La Dialogue in June 2018, articulated: "The Indian Ocean has shaped much of India's history. It now holds the key to our future". He also spoke about a "comprehensive agenda for regional cooperation amongst the Indian Ocean Rim Association (IORA), strategic partnership with the Association of Southeast Asian Nations (ASEAN)" and that "India's growing engagement is accompanied by deeper economic and defence cooperation". In reference to the wider context of the Indo-Pacific region, he committed to "promote a democratic and rules-based international order, in which all nations, small and large, thrive as equal and sovereign. We will work with others to keep our seas, space and airways free and open". He reiterated, "We should all have equal access as a right under international law to the use of common spaces on sea and in the air".[45] It was probably for the first time that 'air and space' were mentioned by an Indian prime minister in a strategic geopolitical and security context. While it indicates an understanding of the salience of the aerospace domain by the national leadership, the need to follow up with an 'aerospace strategy' warrants serious consideration by the security establishment. Given the importance of the maritime domain in India's future trajectory:

> ... the vast IOR is largely left to an overstretched IN, and needs a stronger, more focused and joint approach for safeguarding our interests. All maritime strategic thought with a carrier-centric air power mindset, tends to ignore the significant capabilities that land-based air power brings to the table. Without underestimating the strategic capabilities of a CBG, it, however, takes a significant preparatory time to sail out and reach the area of interest. This 'response-reach' lag can be compensated in the interim, with the swifter response and the extended reach capabilities

44. n. 36.
45. Prime Minister's Keynote Address at the Shangri La Dialogue, June 1, 2018, MEA, GOI, Media Centre. https://mea.gov.in/SpeechesStatements.htm?dtl/29943/Prime_Ministers_Keynote_Address_at_Shangri_La_Dialogue_June_01_2018. Accessed on January 10, 2022.

All maritime strategic thought with a carrier-centric air power mindset, tends to ignore the significant capabilities that land-based air power brings to the table.

of the IAF. The long range stand-off precision weapons, mission packaged with AWACS/AEWC/Maritime Reconnaissance aircraft and flight refuellers, is a potent coercive force. It enables Indian air power to be strategically applied across widely separated maritime spaces towards enhancing net security, enabling regional stability and undertaking tasks in the national interests.[46]

CONCLUDING THOUGHTS

Threats to states and humankind have expanded beyond the conventional to the hybrid, extending from our territorial boundaries of home and hearth, to merge the military and civilian domains. Add to these the increasing repertoire of challenges from issues such as climate change, pandemics, humanitarian crises born out of conflicts and natural disasters. For India, the threats and challenges are myriad, from nuclear armed adversaries to natural disasters. Aerospace power with its redefined capabilities of reach, responsiveness, flexibility, mobility and offensive lethality and adaptability, brings a wide spectrum of both hard and soft power options to the table of comprehensive national power. In the prophetic words of Jasjit Singh more than a decade ago:

> The purpose of the Indian Air Force in the 21st century is to provide the nation with an unparalleled range of options and capabilities through the exploitation of the aerospace continuum. And that it is best done by the Indian Air Force as long as it maintains an integrated vision that seeks to match ends and means, and provides it a strategic direction.[47]

46. n. 17.
47. Singh, n. 1, p. 253.

Indian aerospace power has since expanded its doctrinal boundaries to widen its basket of capabilities to deal with the new age challenges of the future, while simultaneously pushing to expand its capabilities and combat bench strength apace with India's future aspirations. In India's growth trajectory, both economically and as a responsible rising middle power, national interests and security are non-negotiable imperatives. Considering the increasing strength and exploitation of air power by our adversaries in the region, the nation can no longer continue with the current two-dimensional surface-centric approach to security as it limits strategic options and response strategies. It must embrace strategic aerospace power and its broader purpose to "to defend its core values and safeguard its vital interests, of which national defence is but one."[48] Not doing so simply because it does not physically 'occupy' a geographical domain would be *fatalis vitium*.

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48. Ibid., p. 253.