

REVOLUTION IN MILITARY AFFAIRS: EMERGING AEROSPACE COMBAT TRENDS IN SOUTH ASIA

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Abstract

Technology dictates everything in the modern world but nothing is more technical than the human mind. It always gears up to explore new dimensions of the universe. Revolution in Military Affairs (RMA) is the brainchild of a critical human mind that never relies on knowledge at hand and strives for more. Aerospace potential and capabilities have become crucial to modern forces in an age of global reach and South Asia is not an exception in any sense. It is argued that RMA in South Asia is likely to be employed more in aerospace to outmanoeuvre each other (India and Pakistan) in order to carry out rapid offensive operations against the enemy.

This paper examines the emerging trends in aerial combat and military use of space simultaneously with a focus on on-going developments in South Asia. At first, this paper explores the emergence of aerospace potential for military means among major powers during the cold war. Following emerging global aerospace trends, it focuses how it encouraged a shift in strategy and doctrines of India and Pakistan because of drastic change in weaponry and how it created more space for the aerospace domain. Moreover, this paper analyses the defensive potential of arch-rivals India and Pakistan and explores the prospects of the aerospace industry in Pakistan.

Keywords: Revolution in Military Affairs, Technology, Dominant Battlespace Knowledge, Global Positioning System

RMA: A Theory of Modernization

The genesis of RMA, a pervasive concept, is rooted in the thinking of Soviet Marshal Nikolai Ogarkov who coined the term Military Technical Revolution to better understand the lethality and potential of conventional weapons.¹ There is still a debate whether RMA has taken place or is still in the process. In his war treatise, Toffler identifies two major revolutions while Krepinevich highlights ten major and minor revolutions in military history since the 14th century.

He further explained that military revolutions occur due to simultaneous change in multiple domains, like a technological, economic, social, cultural, and military transformation for a relatively long period of time and have a direct impact on strategy and doctrines. While Minor revolutions take place due to individual social or technological change over a short period of time. Major revolutions are abrupt and imminent and thus cannot be controlled but on the

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contrary, minor revolutions can be manipulated deliberately.² “Initiation of a revolution requires revolutionaries” is the core of RMA.³

The drastic use of military technology in both Iraq Wars 1991 & 2003 are considered the manifestation of RMA that dragged other militaries to a situation either to pursue same approaches in defence to be recognized as “credible military power” or abandon military competition and give up.⁴

Many of the modern military analysts are of the view that the world is on the threshold of Revolution in Military Affairs (RMA) having passed through the warfighting like Blitzkrieg, aircraft carriers, large scale amphibious and airborne assault, nuclear weapons, ballistic missiles, strategic bombing, and submarine-launched missiles.⁵ In a time to come, there would be a great focus on integrated command structure, real-time surveillance, electronic and cyber capabilities, aerospace and outer space contests. The spread of asymmetric capabilities like unmanned aerial vehicles, robotics, and guided missiles could drastically change the dynamic nature of warfare.⁶ This variation of warfare demands the robust aerospace capabilities for real-time information like geostationary positioning, communication satellites and Intelligence, Surveillance and Reconnaissance (ISR).

RMA: Emerging Global Aerospace Trends

In the modern world, it is undeniable fact that aerospace assets are widely used for military purposes, i.e., ISR, communication, the real-time imagery of enemy positions and Dominant Battlespace Knowledge (DBK). RMA and technological advancement have made satellites an integral component of any modern military because dependency on satellites changed the course of warfare with a major shift in operational strategies to outmanoeuvre enemy. The aerospace potential of any state is now considered an integral component of military strength and major powers strive for establishing a technological base and infrastructure to be relevant military power. In the anarchic international system, states tend to maximise their military power to dominate adversaries on ground, air and at sea.

Aerospace: A Concept

RMA has drastically changed the nature of warfare by providing many other modern means to advanced militaries to exploit the enemies around the globe. Aerospace is the branch of science which refers to flying in an atmosphere of the earth and the surrounding space, both aviation and space flight. Our atmosphere is divided into several layers and all are of varying significance for military operations, i.e., troposphere being lowest for air combat, stratosphere for ISR, mesosphere being the final layer of the atmosphere while beyond this, there is thermosphere. The Air operations are mostly conducted in the

troposphere and lower stratosphere, often called “near space” while region beyond this altitude is subjected to space and outer space.⁷ This region is divided into orbits on which the satellites revolve around the earth. There are different types of earth orbits i.e. High Earth Orbit (HEO), Medium Earth Orbit (MEO), and Low Earth Orbit (LEO).⁸

Military use of Aerospace

The military use of space began during the cold war with the launch of Sputnik, a satellite, by Soviet Union that gave a reason to the USA to go for the military use of space satellites. This enhanced the use of satellites by Soviet Union and USA while reducing their reliance on ground-based radars, communication and surveillance means. They deployed aerospace assets for “war fighting, ISR, command and control, force protection, and strategic and tactical communication.”⁹ thus the military use of space dramatically increased.¹⁰ In Ajey Lele’s words, “the usage of space assets to enhance the state’s war-waging capability” became the core component of their strategy and practical deployment manifested their doctrinal shifts towards global reach.¹¹ In addition to intelligence gathering purposes, satellites paved the way for the development of Intercontinental Ballistic Missiles (ICBMs), Submarine Launched Ballistic Missiles (SLBMs) and long-range aircraft bombers.¹²

Aerospace: Strategic Significance

The amalgamation of air and space due to technological advancement provides flexibility in air combat operations and the far-reaching capabilities offer avenues of access anywhere and anytime in the world because aerospace extends the scope of warfare from trenches to manoeuvring, sailing of fleets from shore defences to blue waters, rapid insertion, airlift and resupply of forces at large distances.¹³

In the 21st century, potential space capabilities include photographic reconnaissance, Electronic Reconnaissance, Ocean Surveillance, Communication satellites, Early Warning Satellites, Nuclear Explosion Detection, Navigation satellites, Weather, Meteorological and Geodetic Satellites. These sources provide militaries sensible data for strategic planning, deployment, monitoring, targeting and threat assessment.¹⁴ Navigation Satellites are equipped with a Global Positioning System (GPS) that involves satellites and computers capable of determining latitude, longitude and identify locations irrespective of topography, weather, time and day anywhere around the globe.¹⁵ These elements act like a force multiplier and provide militaries flexibility to out manoeuvre the enemy quickly with minor losses.

BMD: A new Array of Defence

In addition to above-mentioned ISR functions, there are many other ways in which aerospace complements military power projection. Ballistic Missile Defence (BMD) systems are the relatively new introduction to the military capability that can intercept ballistic missiles and fighter aircraft coming from the enemy side. The BMD contains space and ground-based sensors for detection and battlefield management.¹⁶ Early Warning Satellites are specially designed to discern hotspot made by thrust or exhaust from launched ICBMs, jets and subsurface vehicles i.e. nuclear submarines. They are equipped with the infrared sensor array, telescope and a turret mounted on the nose of spacecraft. These systems help BMDs to detect and intercept incoming missiles early in the boost phase as they are easy to intercept in this phase. Thus Early Warning Satellites are considered an integral part of Boast Surveillance and Tracking System (BSTS) that further helps in monitoring and locating launching pads.¹⁷

RMA in South Asia: A Strategic Shift

Today, the world has been facing the 4th generation of warfare and standing on the verge of the 5th generation of warfare. In South Asia, India and Pakistan are two nuclear power neighbouring countries with significant conventional military capabilities as well. By keeping in view the threat perception, both are obliged to modernize their forces with the change of global trends and emerging aerospace trends have forced both to go through strategic and doctrinal changes.

A Strategic Shift in Indian Military

During the first decade of 21st century, South Asia observed military doctrinal and organizational changes in both strategic and conventional fields driven by RMA. This led Indian Army to develop new military doctrine usually termed as Cold Start Doctrine (CSD) which laid much focus on manoeuvring by using advanced technology to fight short duration wars beneath the nuclear threshold. It intends to mobilize the forces faster than the opposing forces and deploy them to unpredictable locations and eventually they disrupt enemy lines on the battlefield.¹⁸ In order to operationalize CSD, "division-sized integrated battle groups (IBG) consisting of artillery, armour, and aviation elements capable of limited offensive operations would be deployed close to borders".¹⁹

Apart from on-ground deployments, deployment of air assets by India further explains the threat perception on their end and their security requirements, i.e., "twenty-two of India's thirty-five combat air squadrons are deployed in Western and Southwestern air commands empowered by modern fighters and bomber jets" along with Pakistani border.²⁰

Along with land military doctrine, Indian Air Force (IAF) coined its own doctrine as IAF Air Chief Marshal Tyagi reportedly said “The redrawn strategic boundaries of resurgent India could extend from Gulf to the Straits of Malacca and from Central Asian Republics to the Indian Ocean. The enlarged strategic dimensions necessitate not only a radical change in our strategic thinking but also accentuate the role of Aerospace Power in the new security arena”²¹ This demonstration of revisionist ideas in the form of doctrine and preceding structural changes doubtlessly explains Indian future designs in the region.

A Strategic Shift in Pakistan Military

Pakistan military has been capable of adapting new warfare realities and military imperatives and to master them since its inception. Indian proposed CSD is perceived as a major threat which pushed Pakistan to produce new nuclear weapons, significantly Low Yield nuclear weapons and relevant delivery system for battle field use, i.e., Nasr missile. The deployment of Pakistani forces and supportive terrains are not conducive to achieve quick victory for Indian military in areas strategically vital to Pakistan. Thus, Pakistan has checked Indian CSD by acquiring capabilities to resist numerically superior military in battlefield and defend its borders.

In Aerial warfare, Pakistan does not have nefarious designs to extend operational capability and air dominance beyond its borders but cannot compromise its aerial defences for which it has to be capable of undertaking counter-offensive operations against an adversary.²² The ideological belief of Pakistan Air Force (PAF) is the emblem, a verse from Iqbal’s poetry ‘Be it Land or Sea, all is beneath my Wings,’ a notion of air dominance.²³ PAF operational doctrines remained ambiguous when it comes to debate on public or academic platforms. Yet, some of the basic doctrinal beliefs prevail in PAF, as ACM Asghar Khan put his dictum “Train to fight outnumbered.”²⁴ ACM Sohail Aman briefly quoted the doctrinal thoughts of PAF in an ambiguous manner as it “tends to accomplish the given set of objectives with efficiency, and more importantly without exposure of large number of ground forces to the enemy fire”. In between the words, it suggests that PAF is ready to fight on eastern front along with ground forces if CSD is launched because IBGs are actively supported by aerial elements as well. And “From policing to precision strikes, and from intelligence gathering to interdiction” by PAF enhances the scope of airpower to aerospace.²⁵ PAF took a role of nuclear weapon delivery, ground supporting missions, fleet protection, maritime strikes and interdiction followed by retaliatory strikes.²⁶

In response to India, Pakistan and China are jointly working to overcome their aerospace problems and are likely to produce a potential deterrent of a

type that might be unimaginable on Indian side before, especially when they are even.²⁷

Aerospace Developments in South Asia

The trajectory is getting higher towards air domain and space with every day passing in South Asia. All offensive and defensive elements are subjected to aerospace be it for air support, reconnaissance, deep cross-border strikes or to defend airspace. In order to achieve this end, robust command and control, Precision Strike Capabilities, and real-time ISR are needed, in other words, aerospace potential is required, the genesis of RMA.²⁸ The emerging trends in air force modernization have immensely enhanced the capabilities of state of the art aircraft to conduct precision strikes against military bases, forward air bases including infrastructure targets.²⁹

Aerospace Trends in India

Some of the military thinkers like Rodney W. Jones argue India is continuously outmanoeuvring Pakistan in revolutionary military technologies and capabilities like ISR, Signal Intelligence, advanced radars and high-performance aircraft, i.e., Aerospace.³⁰ In a modern war scenario driven by new doctrines, IAF is expected to undertake three major tasks which are as follow:³¹

- Decisive accomplishment of assigned tasks
- Dissuade the enemy and neutralize threats
- Capability of effective support to other fighting arms

Trends in Air Force

Implementing such a revisionist strategy requires significantly qualitative and quantitative superiority against an adversary. IAF is much interested in maintaining Air Dominance Combat Jets SU 30MKI up to 270 in numbers and has gone through up-gradation of its MIG 29 fighters. India also has put its weight in Rafael while considering Medium Multi-Role combat Aircraft (MMRCA) among Grip hen, MIG 35, Rafael, Eurofighter and F-16/18.³² India has purchased 36 Rafael from France against \$8.8 billion manufactured by Dassault Aviation. Moreover, India sought investments from French aviation companies like Dassault to invest in India to help the domestic industry with stealth capability and radar technologies.³³

In addition to it, India has sought partnership with Russia to develop Multi-Role Transport Aircraft (MRTA) and Fifth Generation Fighter Aircraft (FGFA) by showing commitment to invest in the project and then purchase but this multi-project with Russia appears to be in peril. IAF intends to abandon the project arguing Russian fifth generation aircraft are inferior to US made F-22 and F-35 and "The IAF doesn't think it's worth pursuing," an official quoted.³⁴

The Unmanned Aerial Vehicles (UAVs) operating on high altitudes provided India with real-time reconnaissance capability and it is likely to be linked with dedicated satellites, an aerospace force multiplier for IAF. Moreover, Airborne Early Warning (AEW) is another element of airpower which is supported by Russian A-50 AEW & C capable of picking up one hundred targets simultaneously. Israel is ambitiously committed to modernize IAF as it offered Phalcon AEW System capable of tracking 500 targets up to 333 kilometres.³⁵ Israel and India, both are cooperating in Missile Defence Systems like BARAK and most updated version BARAK 8 which is capable of intercepting ballistic missiles, aircraft and armed drones.³⁶

Despite all modernization plans, situation is not as gloomy as it appears to be. Against 39 authorised active squadron strength of IAF, it hardly mustered 32 squadrons of fighters including ten squadrons of SU 30MKI, Six squadrons of MiG-21 Bison, three squadrons of MIG 29s, five squadrons of Jaguars, five squadrons of MiG-27s, three squadrons of MiG-29s, two and a half squadrons of Mirage 2000s.³⁷ IAFs diversity in the fighters it operates is what Benjamin Lambeth put as 'unusually diversified' making it more difficult for maintenance and eventually suffers as budgetary constraints. IAF operates seven types of fighter aircraft, four different types of airlifters, three types of trainers and different types of AEW assets which makes the force operationally inefficient. When it comes to the retirement or replacement of old variants, may-be in the next 10 years, it would be difficult to manage operational readiness for IAF.³⁸

Trends in Outer Space

IAF is desirous to raise its strength to some 42-45 squadrons by 2027 operating up to 800 aircraft to preserve the airpower superiority it had enjoyed since 1971 and a budget is being allocated accordingly.³⁹ Along with airpower, space is another priority of IAF and they see space power as a continuation of the air medium of power. India has formally established an aerospace group to formulate grounds for an aerospace command.⁴⁰ Moreover, "progress has been made in the regime of communication and surveillance by space-based platforms using optical, radar and IR sensors".⁴¹ As of now, India has dedicated satellite systems including communication, navigation and earth observing military satellites in outer space, i.e., GSAT 12 for communication, RISAT-1, a remote sensing satellite for earth observation, weather and navigation. India is working on another satellite system namely Indian Regional Navigation Satellite System (IRNSS).⁴² In addition, there are progressive plans in the pipeline in strategic circles of India.

This new system would enable India to operationalize space military program. The indigenously build GSAT-6, GSAT-7, and RISAT-2 are the primary satellites with potential military use in the region. In 2019, India tested anti-

satellite weapon (ASAT) by hitting its own satellite in the space in 2019 which elates Indian capacity to out manoeuvre Pakistan in space militarization.⁴³ India has become fourth country in the world after USA, Russia, and China to develop and test ASAT technology. It further reflects the Indian ambitions to militarize the space to achieve competitive edge against Pakistan and a degree of deterrence against China.⁴⁴ In case of conflict in South Asia, ASAT technology could be of great advantage for India to threaten communication and intelligence gathering satellites of adversaries. India realized the need for counter technologies after increasing its space based assets to a significant degree.

Furthermore, this technology coupled with improving ISR capabilities would consolidate Indian aerospace defences strong and hard to penetrate. As India is acquiring Russian made S-400 Ballistic Missile Defence System, its possible operationalization and integration with Indian space assets would further elevate Indian confidence in case of conflict.⁴⁵ It is because the space based satellites can potentially improve information gathering and space based detection of any upcoming projectiles.

Thus, the technological superiority of India enables it to constantly monitor strategic manoeuvres Pakistan might undergo. In sum, Indian military is using 13 satellites stationed in space which work as an early warning system for India even in the peace time.

Aerospace Trends in Pakistan

The overall military imbalance between India and Pakistan has put PAF in a situation to take a role in preventing ground forces exposure to enemy and ensure aerial defence. For this purpose, PAF is investing in acquiring new equipment and going through rationalized force structural changes.⁴⁶ Having firm belief in Asghar Khan's dictum, PAF is so structured and trained to outnumber the enemy, thus has always managed to deteriorate IAF's desired margin of superiority by limiting it to less than 2:1.

Trends in Pakistan Air Force

PAF has put all its efforts to ensure this objective by investing in vigorous pilot training and diverse EAW capabilities and rationality based force structure. The pivotal war machine of modern force structure is F-16, being a high end fighter up to Block 52 and MMRFA JF-17 which would replace lower end combatant fighters Mirage III/IV and the Chinese made Q5. PAF is trying to acquire fifth generation Chinese J-31 which would eventually make PAF three tier multirole force.⁴⁷ The day is not too far when PAF would operate forty J-31 high end stealth fighters, hundred F-16s equipped with Beyond Visual Range

(BVR) Air to Air Missile (AAM), 250 JF-17 at lower end and smaller number of J-10 remaining at the centre.⁴⁸

Under Armed Forces Development Plan 2019 (AFDP), PAF has been acquiring force multiplier AEW, AWACS, IL-78 aerial refuelers and upgradation of ageing F-16s. All the efforts are being made to make PAF a viable force “in synergy with other services, the most efficient, assured and cost effective aerial defence of Pakistan”⁴⁹

In Modernization of PAF in different aspects, i.e., aerospace, the cooperation of China cannot be ignored. Both, China and Pakistan, see India as a common enemy in region and potential rival at global level. Pakistan and China, both are sharing Strategic Partnership and working on aerospace as a Joint Project producing light weight multirole all-weather JF-17 fighter jet capable of delivering different variants of missiles including BVR.⁵⁰ The experts argue that the strength of JF-17 lies in its aerodynamics and state of the art avionics. It can fly with a maximum speed of 1.6 Mach and 700 knots having high thrust to weight ratio and hybrid flight control systems. Its missile approach warning systems, tracking while scanning and dual target attack radar modes enhances not only the survivability of jet but also keeps aware the pilot with real time combat environment.⁵¹

PAF laid the foundation stone of Aviation City and Air University Aerospace and Aviation campus at Kamra. In order to operationalize the city, the Aviation Research, Indigenization & Development (AvRID) and R&D projects in specific technologies are being set up. At the ceremony, ACM PAF Sohail Aman unveiled the details of Project Azm which will develop fifth generation fighter, Medium Altitude Long Endurance (MALE) UAV's, aviation platforms and munitions.⁵²

Trends in Outer Space

Along with the modernization of air power, space program of Pakistan was started in 1960s when SUPARCO was established. It launched first missile named Rehbar-I with the help of NASA and communication satellite series Badr in 1990s. Pakistan has been busy in checkmating India in ground assets like tanks and nuclear missiles while global trends in aerospace were suggesting otherwise. The economic constraints can be a contributing factor along with poor technological base, limited R&D and scarcity of human resource. At the same time, it did not pay requisite attention to space programs, thus it has been lacking force multiplier capabilities to feed its military potential.⁵³

In 2011, Pakistan has launched indigenously built satellite PAKSAT-IR in outer space in collaboration with China but is widely for commercial use as Chairman SUPARCO put it “Pakistan Army is not major client of PAKSAT-IR”. China is a new partner of Pakistan space program as Pakistan has shifted and

operationalized geo-location tracking on Chinese based BeiDou Navigation System (BDS) in 2012 while its constellation was completed in 2020.⁵⁴ Pakistan is planning to build own UAVs under Project Azm which would need dedicated military communication and navigation satellites for its operations, i.e., taking commands for intelligence gathering and to hit target and to relay real-time data back. Pakistan Space Vision 2040 was announced in 2011 by National Command Authority (NCA) which stated it will “bring the benefits of the full spectrum of space technology” for Pakistan.⁵⁵ In this regard, PAF revealed a Space Command and Control in a brief video which reflects seriousness in the strategic policy circles to develop a significant degree of space assets in the wider national interest of the country. For real time intelligence and space-based EAW, an array of satellite systems is needed as expressed by NCA which indicates that in a time to come, Pakistan would enter in space nations club solidifying its defensive fence.

Deterrence and Strategic Stability in South Asia

With outer space militarization in South Asia, the security concerns of Pakistan are looming while the readily available options at hand are squeezing. Pakistan has vigorously maintained the Credible Minimum Deterrence and Full Spectrum Deterrence to check India by means of conventional and strategic forces but this new challenge raises concerns in strategic circles in Pakistan. Ambassador Zamir Akram, Advisor to Strategic Plans Division Islamabad and Khurram Akhtar, Director General Arms Control and Disarmament at Foreign Office Pakistan, participated in a public debate in Islamabad Policy Institute titled ‘Quest for Peace and Strategic Stability in South Asia’ on May 28, 2021.⁵⁶ Their concerns are akin to the concerns of state as they raised concerns over tenuous strategic stability in South Asia. Ambassador Zamir Akram noted that India is developing integrating warfare technologies such as Artificial Intelligence, autonomous weapons, and cyberwarfare with the American support which cannot be ignored by Pakistan. ‘Pakistan will have to respond to these developments and cannot remain complacent’, he added. The test of ASAT weapon by India brought a negative qualitative change in the comprehensive threat spectrum of Pakistan as it endangers the nascent space program of Pakistan.

These concerns can be further broken down into specifics by analysing the capabilities of these new integrating technologies, state intentions and the pace of progress in either country. It is because India’s dominance in space and rise as a space power would come at the cost of the interests and security of Pakistan. Space program not only gives advantage in peace time surveillance but also increase ISR capability in war time due to dual purpose use of these satellites. Furthermore, the ASAT weapons can potentially disrupt communication and intelligence gathering space infrastructure of Pakistan. The

growing space program has the potential of supplementing Ballistic Missiles in target precision, can act as early warning system for Ballistic Missile Defence systems in the future. With the test of Agni-V, the ICBM, further elevates Indian profile in nuclear proliferation and weaponization of outer space, a grave concern for Pakistan. In this regard, India held Space Warfare Exercise 'IndSpaceEx' in 2019 to test the integration of existing technologies and analyse the prospects of emerging technologies in Indian military arsenal.⁵⁷ Cynically, this exercise could be a signal of threat to Pakistan's space program which obviously is at a disadvantageous position against India.

There are very limited options available to Pakistan short of entangling in arms race and proliferation. The changing geostrategic and technological landscape is fast moving ahead from face-to-face pitching of armies for territorial gains and strategic depth, rather modern militaries today prefer threat neutralization over forcibly scaling down. The role of ISR, Remote sensing, situational awareness, intelligence gathering, and early warning systems in strategic decision making is enhanced while military operations are guided from Command Control centres instead of battlefield command posts.

Given the technological landscape and economic restraints, it is not feasible for Pakistan to make a clueless move towards space militarization rather a well thought out steady approach would work in the face of Indian aggression in the space domain. In the short term, it is pertinent for Pakistan to take measures to develop low-cost disruptive technologies such as electronic and cyber warfare to challenge evolving Indian space program.

The Prospects of Aerospace Industry in Pakistan

Aerospace industry in Pakistan has not been much promising to get self-reliance but certain developments and continuous efforts determine the bright trajectory of its growth. Pakistan Aeronautical Complex has been contributing to PAF from the very first day and moving ahead towards self-reliance in producing some quality equipment for PAF. However, SUPARCO, a space research institution of Pakistan, is lagging behind in terms of military use of outer space which is reality in a world out there.

Air Marshal Asghar Khan said "Had this venture materialized long time ago, Pakistan may well have acquired an aircraft manufacturing capability long time ago" after being appointed head of PAF.⁵⁸ Initially, PAC comprised an F-6 rebuild factory, a Mirage rebuild factory and an aircraft manufacturing factory as initial basic facilities at PAC while the Aircraft Manufacturing Factory (AMF) was established in 1975. It produced Mashsak trainer aircraft, trainer jet aircraft K-8, and assembled an UAV Falco in 2008. PAC is currently producing JF-17, a light weight multi-role fighter aircraft with the help of China but Pakistan has 58% exclusive rights of project. AMF houses core infrastructure for aircraft

manufacturing like machining centre, modern CNC machines, computer aided design system linked with Computer Aided Manufacturing System and sophisticated technologies to support the project.⁵⁹

Pakistan defence industry has developed from embryonic stage to a phase where it is in a position to support Pakistan military in terms of military hardware and indigenously built equipment. Pakistan has taken drastic steps towards self-reliance in aerospace for which initially academia is engaged in R & D with aerospace industry, particularly PAC. The establishment of Aviation City and Air University Aerospace and Aviation Centre is being considered a centre-piece of self-sufficiency in aircraft manufacturing. This aviation city would house research houses, simulation centres, learning facilities regarding maintenance and avionics repair workshops.⁶⁰

In order to operationalize the city, the Aviation Research, Indigenization & Development (AVRID) and R&D projects in specific technologies are being set up. At the ceremony, ACM PAF Sohail Aman unveiled the details of Project Azm which will develop fifth generation fighter, Medium Altitude Long Endurance (MALE) UAO's, aviation platforms and munitions.⁶¹ The contributing factors towards this end are analysing worthy and first step to pursue fifth generation fighter jet would be acquisition of J-31, a Chinese made twin engine fifth generation jet or a further collaboration with Chengdu Aircraft Industry Group (CAIG) of China. It is to be noted that JF-17 are being produced jointly with participation of CAIG. Pakistan may further seek prospective partnership with TFX, Turkish modern generation fighter programme about which Pakistan and Turkey are in contact for two years.⁶²

In present capacity, PAC is co-producing JF-17 which suggests PAC has the capacity to engage in more technically advanced projects and gradually move towards self-reliance in aircraft manufacturing. Like every new Industry, PAC has faced problems at AMC while manufacturing JF-17 Block I regarding smoke emissions, air intakes, avionics and Chinese made radars and vertical tail fin. But Block II has been equipped with more modern radars and avionics, i.e., Avionics S-7 Doppler radar with better look down shoot down capability, air intakers are widened which is a more refined variant of JF-17.⁶³ In his farewell speech, former ACM PAF Sohail Aman announced that design of JF-17 Block III has been made and production would start in 2019 or 2020. This is a major development towards self-reliance in aircraft manufacturing because it would be the more advanced version of earlier blocks.⁶⁴

The defence production facilities require unrestricted financial support for carrying out their production. The budget of PAC is well beyond the capacity of PAF, thus it is directly funded by Ministry of Defence Production.

Senate standing Committee on defence production recommended the allocation of separate annual budget for Ministry of Defence Production. It intends to make production units at PAC more efficient and self-reliant by financing based on their requirements.⁶⁵ In order to contribute in national security, Pakistan space agency SUPARCO has announced Space Vision 2040 that stated: "Strive to achieve self-reliance in space technology and applications for national security, economy and society."⁶⁶ If outer space assets are used in full swing by armed forces, the capability of ISR, communication, C2, Intelligence Gathering and DMK will be drastically enhanced and will work as a force multiplier.

Conclusion & Recommendations

RMA has pushed Pakistani armed forces to adapt to new realities of innovation in technologies, warfare doctrines and operational tactics. In modern warfare, everything is technologically driven and most likely to be used accordingly. Pakistan Army and PAF have always been responsive to every new change and present trajectory suggests they are gearing up for facing future challenges as well. The economic restraints have made Pakistan reactive to India as India acquires a capability first and Pakistan reacts to mitigate the threat. This approach must be changed and Pakistan should come up with such innovation that can push India to go through a shift in present thought process to disturb its military balance. So far, India is a threat to Pakistan and it is likely to be there for decades to come so following India can never be a good choice for Pakistan.

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