Emerging Chinese Aerospace Capability and Its Impact on Regional Balance

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Introduction

The Ninth Century Chinese alchemists discovered black powder while searching for the elixir of life. This accidental discovery led to experiments for weapons such as bombs, cannon, incendiary arrows and rocket-propelled fire arrows.[1] The Chinese were the first to develop a rocket around 1212 AD and used them in a war with Mongols. During the battle of Kai-Keng, they used "arrows of flying fire". This arrow was a simple form of a solid-propellant rocket.[2] From development of simple rockets to anti-satellite weapons, China has progressed rapidly in its aerospace offensive capabilities and the anti-satellite test carried out by China in Jan 2007 demonstrated that the development of anti-satellite (ASAT) technologies created an environment in which civil and military satellites increasingly came under the risk of attack. In response, Dr. Saraswat stated that India had "all the building blocks necessary" for an anti-satellite weapon. The propulsion module and kill vehicle existed in principle; the weapon could be developed in totality soon.[3] Yet, the moot question is whether India is ready to face the rapid Chinese modernization onslaught?

As regards, modernisation of People's Liberation Army-Air Force (PLAAF) is concerned, the modernisation begins with doctrinal and strategic changes and continues with organisational transformation and simultaneously, equipment acquisitions. China has pursued all these elements simultaneously, albeit unevenly.[4] The creation of the Western Theatre Command by merging two former Military Regions (MRs) is leading to more synchronised operations against India. The replacement of the four erstwhile powerful

military departments with 15 'Functional Departments' as part of the restructured Central Military Commission (CMC), has diluted the dominance of the Army over the other Services.[5] These measures would significantly enhance integration between the different Services as also various arms within the Service and provide more effective control over wide variety of weapon systems deployed at Tibet Autonomous Region (TAR).

China's Air Force has improved significantly in the last ten years. Although the combat aircraft strength has decreased from 3520 in 2000 to around 1693 in 2012, China's inventory of fourth generation aircraft has increased significantly. PLAAF has fighter strength of around 700 aircraft of SU-27/SU30/J-10/J-11 class. By 2020 PLAAF is expected to field about 1000 4th/5th generation fighters.[6] The PLAAF is also developing significant stealth capabilities and has tested prototypes of J-20 and J-31 with stealth features. On the other hand, India's Fifth Generation Fighter Aircraft (FGFA) development with Russia is floundering and has received a critical setback. The crucial strength of PLAAF lies in establishment of a long range air defence (AD) network.[7] The People's Liberation Army (PLA) is also equipping itself with fourth and fifth generation fighter aircraft, force multipliers and precision guided long range air defence weapon systems. The development of wide network of airfields in the region close to the Sino–India border can facilitate rapid force mobilisation. The Tibetan airfields have the potential to render the formidable natural Himalayan barrier ineffective.[8]

Regional Space Environment

In the Indian subcontinent, there exist a number of space organisations, launch platforms, space based assets, Space Command and Control Centres and global space tracking networks. The long term plans of China include establishing space based stations, manufacturing reusable space shuttles and developing potent anti-satellite capability. China's military space capabilities currently are focused in five distinct areas. These include space launch capabilities, Tracking, Telemetry and Command Network (TT&C Network), space orbital systems,

providing connectivity to military operations and counter-space technologies.[9] China's satellite navigation system (Bideou) is operational since December 2011.[10]

These abilities are complemented by a robust surface to surface cruise and ballistic missile capability. The ranges of the Chinese missiles extend from 180 km to over 13000 km. An analysis of the ballistic missile capability in the region indicates that China has the potential to strike at any vital asset of India accurately with limited warning. Coupled with potent nuclear weapons, this capability portends serious connotations. India's stated policy of 'No First Use' also makes it incumbent that an effective defence against surface to surface missiles (SSMs) is put in place. It is for this reason that acquisition of S-400 from Russia has assumed crucial significance. Yet, what India needs desperately is a Ballistic Missile Defence (BMD) shield.

In the Indian context, flight times of missiles to targets vary from six minutes to 30 minutes depending on the location of the launch site and that of the intended target. Quick detection and interception becomes essential to neutralise these missiles. The major portion of the boost and terminal attack phase of the missiles is endo-atmospheric and cruise phase is exo-atmospheric. The Anti-Ballistic Missile (ABM) systems acquired need to tackle these missiles in all the three phases of flight and hence would require an integrated Aerospace Defence network that includes fusion of air and space assets.

During missile launch and boost phase, the SSMs have large infra-red signatures. Early Warning (EW) satellites can detect and track their launches. During cruise phase, the target's temperature closely resembles that of its surroundings; hence, detection is not effective by discriminating its Infra-Red (IR) signature. Different forms of surveillance systems are, therefore, required to track the missile's path and these include ground based X Band Radars and Phased Array Upgraded Early Warning Radars (UEWRs). India presently doesn't have either EW satellites or UEWRs.

The 1972 ABM Treaty between the United States of America and the erstwhile Soviet Union was on limiting the use of ABM systems against missile-delivered nuclear weapons.[11] The US

Government withdrew from the ABM treaty unilaterally on 13 Jun 2002.[12] This not only opened the path for the development of missile interceptors but also cleared the way for development of anti-satellite weapons.[13] The advanced space capabilities that are being developed include high technology systems such as the Boost Phase Intercept (BPI) Airborne Lasers (ABL), Kinetic Energy weapons, cruise phase intercept by Space Based Infra-Red Systems/Low Space and Missile Tracking Systems (Brilliant Eyes), High Energy Lasers, mini satellites as ASAT weapons, terminal phase intercepts by BMD systems and advanced BMD systems. It is implausible that China would allow the US to become the only nation that possesses space based weapons. The PLAAF Commander Xu Qiliang, in an interview stated that militarisation of space was a *"historical inevitability"* and it was imperative for the PLA Air Force to develop offensive and defensive operations in space.[14] The Chinese development of parasitic satellites, High Energy Lasers and other ASAT weapons is a precursor to the commencement of such a race. *Space control would soon become an important component of national security even for ensuring commercial operations.*

India is currently developing a two tier BMD system capable of tracking and destroying incoming missiles in both modes; inside (endo) and outside (exo-atmospheric).[15] The system comprise long-range tracking radars picking up incoming missiles approximately 600 km away, a command, control, communications and intelligence (C3I) system and an interceptor surface-to-air missile.[16] The first test of the Atmosphere Intercept System was carried out in November 2006 at an altitude of 40-50 km. This system is similar to Arrow-2 BMD system.[17] In December 2007, an endo-atmospheric interceptor successfully intercepted a Prithvi Missile at 15km altitude; akin to the PAC-3 system. In March 2009, third successful test was conducted. After three successful tests of the BMD programme, the Defence Research and Development Organisation (DRDO) announced that the first phase of the missile defence shield would be completed soon. In these tests, interception of incoming missiles was carried out both in exo-atmospheric and endo-atmospheric modes. The test using Prithvi Air Defence (PAD) interceptor at 75 km altitude indicated that India could now engage Intermediate Range Ballistic Missiles

(IRBM). In Phase-I, capability to intercept IRBMs was tested and in Phase-II, the BMD system would tackle 5000 km range missiles. However, these systems are still a distance away from their operational deployment in the form of a BMD shield.

Emerging PLAAF Capability

PLAAF is the largest Air Force in Asia and is the third largest in the world. PLAAF aims to convert from a limited territorial defence force to a more flexible and agile force, which will be able to operate offshore in defensive and offensive roles. PLAAF also plays a crucial role in *"joint anti-air raid campaign"* as part of *"active defence"* strategy to attack enemy's air and naval bases.[18] PLAAF is preparing to wage a vigorous, defensive battle in its own airspace. It has acquired advanced fighters such as Su-27/Su-30MKK. The Chinese force is a lethal combination of advanced fighters and effective long-range surface-to-air missiles with advanced surveillance, command and control system needed to integrate them.[19]

Current estimates peg the number of fourth-generation aircraft with the PLAAF as around 700-800, with a combination of J-10s, J-11s, Su-27s, and the potent Su-30 MKK multirole fighter jets. The latter is comparable in performance and capability to IAF's Su-30 MKI. The PLAAF views stealth technology "as a core capability in its transformation from a predominantly territorial Air Force to one capable of conducting both defensive and offensive operations". With the induction of J-20A low observable aircraft, China's first fifth-generation fighter jet represents the evolution of this threat to the IAF. The J-20's radar-evading properties could give China the ability to carry out stealth strikes inside Indian airspace in the opening phase of a conflict.[20]

The PLAAF has adopted *"light front, heavy rear"* approach, thereby emphasising quick aggressive attacks with strong air defence. PLAAF missions include air coercion, air offence, blockade and close support. Structural reforms have revamped the organisational structure while operational reforms equip them with weapons and firepower needed in new scenarios.[21] This approach implies that rear bases would be utilised to launch offensive air missions and forward air bases for refuelling and

rearming till the air power of the enemy is degraded to the desired extent.

In defending China's core national interests, PLAAF capabilities, doctrine and training have been developed to support a comprehensive anti-access/area-denial strategy. The Chinese concept of active defence as well as recently modernised PLAAF capabilities, doctrine and campaign planning has predisposed the PLAAF toward this approach.[22] New establishments have significantly reduced the earlier weak areas in training and testing. Central Flight Test Establishment (CFTE) has a test centre in Xian-Yanling and undertakes weapons integration testing at DingXin. FTTC tactics too are tested here. The type of aircraft and the complexity of simulated scenarios have increased. Using new tactics of FTTC and simulations at CFTE, PLAAF has learnt to better utilise Su-27s and other aircraft.[23]

This has resulted in overall reduction of aircraft and a concurrent increase in the quality of its aircraft fleet. PLAAF is also developing its own fifth-generation fighter, the J-XX and the S-37A, as a possible counter to the advanced Western stealth fighters such as the F-22 Raptor.[24] This would significantly enhance their stealth capability and their combat edge over the Indian Air Force (IAF). The short term goal of the PLAAF is to develop a fourth-generation Air Force by 2025 (with integrated command, control, communication, computers, intelligence, surveillance and reconnaissance (C4ISR) systems for increased battle effectiveness) and the long term goal is global reach through aerospace dominance.

Comparison between the IAF and China's Aerospace Capability

An objective comparison between the IAF and the PLAAF indicates that PLAAF has significant quantitative superiority in terms of fighter aircraft, 3.7 vs. 1. Their modernization process, which is mainly indigenous, highlights that the qualitative asymmetry is likely to increase from 2018-2025 period as majority of its projects bear fruit. It is also likely to have significant superiority in terms of fourth generation fighter aircraft (J-10, JF-17, J-11 and Su-27/30 fighters), Directed Energy Weapons, space

based assets, anti-satellite weapons, network centric warfare and force projection capability, Airborne Warning and Control Systems and strategic air lift assets.

The PLAAF currently maintains around 1700 combat capable aircraft. The PLA Navy has around 300 aircraft, of which about 30 per cent are current generation. The aircraft include 220 J-10, 180 J-11(Su-27), 97 Su-30MKK, 156 JH/FB-7, 516 J-8, and 350 plus J-7. Since 2003-04, the PLAAF has inducted around 220 J-10 fighters, which are of F-16 class. China in the near future is likely to emerge as one of the major producers of contemporary fighters with annual capacity to produce 45 to 50 fighters of J-10 and J-11 class. China is upgrading its air combat capability in terms of developing long range air-to-air missiles. It is now fielding extended range PL-15 that will significantly impact the IAF operations of air-to-air refuelling tankers and Airborne Early Warning and Control Systems (AEW&C)[25] in TAR. Coupled with long range Air Defence systems such as S-300, Chinese tactical deterrence has become significantly enhanced.

The development of China's J-20 fighter and fifth generation aircraft pose considerable strategic challenge to India because the Indian Air Forces' existing SU-30, MiG-29, Bison and Mirage fighters match up only to China's fourth generation J-10 and older J-7 aircraft, but would be significantly disadvantaged when the J-20 becomes fully operational with advanced super-cruise and stealth features. This implies that by 2025, the PLAAF would be able to field around 1300 modern aircraft, thereby, bringing in significant combat edge and conventional advantage in addition to the overwhelming lead it has in nuclear and ballistic missile fields. Though the Chinese aerospace industry is making rapid technological progress, but the ability to build modern generation, super cruise-capable engines may be a key issue that would decide whether J-20's real operational capability will be met or not.

China's key deficiencies are lack of development in the TAR, there are limited logistics supply lines to TAR, there are limitations imposed by high attitude operations. IAF suffers in terms of lack of

an effective BMD system, anti-satellite capability, stealth technology and Geographic Information Systems. In addition, lack of integration amongst the three Services and limited number of high technology offensive assets (fourth/fifth generation fighters) would limit India's ability to respond effectively in fast paced high technology integrated operations.

China has built six fully operational air bases, an extensive rail network and over 58,000 km of roads in TAR. The six airfields include Gongga, Pangta, Linchi, Hopping, Hotan and Gar Gunsa. PLA is also upgrading other air strips in TAR and in South China and its Su-27/30, J-11 and J-10 fighters have practiced operations from these airfields. In addition, by 2022, China is building three airports in Lhunze, Shigatse, and in Burang. These airports can aid the Chinese military by acting as launch bases for support of troops as well as replenishment of supplies in Tibet.[26]

It is estimated that PLA can mobilise around two divisions in TAR in just twenty days as compared to the earlier 90 days. Extension of Quinghai rail services to Xigaze is under completion.[27] On the other hand, there are significant infrastructural limitations in Arunachal Pradesh and in the Northern areas of India. Though India is upgrading Pasighat, Nyoma, Mechuka, Walong, Tuting and Ziro ALGs, yet technology differential and poor infrastructure development in the area opposite TAR would play a key role in future operations.

In China, there are a total of 16 airfields in TAR and the nearby regions of the North Eastern part of India that could be utilized against India. Air to air refuelling has enhanced this capability further. PLAAF can deploy around 24 squadrons in these airfields. In Tibet, the airfields lie within 300 to 1,000 km from IAF bases and are at high elevation. The altitude reduces carriage of bomb load; however, PGMs have significantly reduced the need for carrying heavy load. Aerial refuelling and high performance capabilities of Su-27, Su-30 and J-10 aircraft will offset altitude disadvantage to quite an extent.[28]

China's tools for asymmetric warfare include developing cyber warfare capabilities, anti-satellite weapons, different types of lasers, development of Unmanned Combat Aerial Vehicles

(UCAV), advancement of ballistic and cruise missile technologies and refinement of anti-ship ballistic missiles to target aircraft carriers to promote its anti-access area denial strategy. It is here that the asymmetric effect caused by such technologies would play an important role in the prosecution of future wars. Time has come for India to take urgent steps to ensure that our research and development organisations become accountable in quickly developing such technologies.

Since 1990s, the conventional missile component of the PLA's rocket forces has emerged as centerpiece of China's military modernisation programme. This missile force has grown in size and sophistication and China has developed a potent doctrine for its employment. It, therefore, plays an important role in deterrence and war fighting.[29] DF-31/31A ICBMs, DF-21s and DH-10 cruise missiles have become operational and China is gradually building such integration that exploits rocket forces as a major offensive arm that can paralyse the functioning of the adversary's combat potential from long ranges. In 2017, China unveiled modern DF-31AG ICBMs, which feature greater mobility. It is also developing DF-41, a road mobile ICBM capable of carrying multiple independently targetable re-entry vehicles (MIRVs), and hypersonic glide vehicles (HGVs) for strategic deterrence and regional strike missions.[30]

Sandwiched between two adversaries China and Pakistan that work in close strategic collaboration and confronted with missile threats, if there is any country that needs Ballistic Missile Defence it is India.[31]

In May 2013, China tested a rocket carrying payload over 10,000 km suggesting that the rocket could be designed as an anti-satellite weapon. It has also experimented with green and blue laser weapons with US military accusing China of firing laser beams at their satellites (laser pulses can disrupt/destroy satellite communication).[32] This implies that not only has China developed the ability to target reconnaissance satellites operating in Low Earth Orbit (LEO), but they are also developing capability to attack Medium Earth Orbit (MEO) and subsequently High Earth Orbit (HEO) satellites. In MEO, come GPS satellites operating at

around 22000 km altitude and at HEO, are Communication satellites operating at 36000 km.

It is appreciated that China currently has the ability to destroy LEO Satellites, which indicates that our Surveillance and Reconnaissance satellites would be under severe risk. This implies that there is a need to have a number of satellites ready for launch including mini and micro satellites and in the event of our satellites being targeted, we would need to launch them at short notice. It also implies that we need to develop our own anti-satellite weapon technology quickly as well as work towards researching on developing stealth technology features in satellites.

China is developing manoeuvrable hypersonic reentry vehicles, which could be used as weapons to defeat missile defences. Its hypersonic vehicle flew at 30 km altitude reaching Mach 7 speed. The most promising Chinese programme is turbo-aided rocket-augmented ram/scramjet combined cycle (TRRE), which uses integrated liquid-fuelled rockets to boost performance of ramjet stages and make smoother transition to Mach 10. With key components like engine inlet, cooling and combustion already developed, full-scale TRRE is expected to begin flights by 2030.[33] This would then become a significant challenge for Indian Aerospace deterrence.

Meanwhile, the Indian Defence Research and Development Laboratory's Hypersonic Technology Demonstrator Vehicle (HSTDV) is aimed to attain Mach 6.5 speed at 32.5 km altitude. Flight testing of a full-scale air-breathing model powered by a 1,300-lb thrust scramjet engine would soon be carried out.[34] This would also place India in the hypersonic technology league. However, the development of hypersonic technology in India is very slow. In the missile field, *Shaurya* is a hypersonic surface to surface tactical missile developed by DRDO with a range between 750 to 1,900 km and it is capable of carrying a payload of one ton, either with conventional or nuclear warhead. It has been successfully tested three times. India is developing *Brahmos-2K* (around 600 km range) and *Zircon* based hypersonic missile (tested to Mach 8 speeds). *Brahmos-2K* is likely to be fielded

around 2022-24 whilst HSTDV similar to Boeing's X-51 and Chinese WU-14 hypersonic vehicles[35] may take time for operationalisation. Yet our defence research is proceeding at snail's pace and there is an urgent need to completely overhaul the functioning of our indigenous research organisations.

Conclusion

The rate at which the technology differential is increasing between the IAF and the PLAAF aerospace capability, by 2025, China would be placed at a significant aerospace advantage. Since Xi Jinping is likely to remain the General Secretary of the Communist Party of China, the modernization and the integration of the Chinese Armed Forces will continue to take place at a rapid pace. This will ensure that the PLA capability differential is enhanced to such an extent that by 2025 Chinese regional dominance will become a reality. On the other hand, modernisation of Indian Armed Forces is bogged down by bureaucratic procedures and processes and lack of accountability of the defence research organisations. There is an urgent need to undertake rapid and significant reforms both in the higher defence management structure as well as in Defence Research and Development organisations.

The IAF lacks stealth capability and an effective Ballistic Missile Defence shield that is effective against preventing both endo and exo-atmospheric threats. In addition, our aerospace capability needs a boost in developing both anti-satellite technologies for counter space operations as well as in developing anti-satellite defence. In all these areas, piecemeal and halfhearted efforts are taking place currently by multiple agencies. Further, an integrated niche technology development strategy needs to be identified and all the multiple agencies involved with its development brought on board under a single control that includes the research organizations, defence forces, industry, scientific society and civilian bureaucracy. Then and then only can we effectively hope to counter an emerging China. Instead of going for acquisition of large scale fourth generation aircraft, there is an urgent need to move quickly towards developing a potent fifth generation fighter aircraft, even if it implies that we need to

contribute more in terms of finance for its development. Sometimes, taking a step back so that we can take two steps forward and a huge significant jump later may be better.

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