6. Strategy for the Air Domain

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Introduction

Any operational contingency in the future will demand control of aerospace, situational awareness, Intelligence, Surveillance and Reconnaissance (ISR), using aerospace assets and precision strike capability. India's aerospace elements have been transforming the armed forces into multi-spectrum strategic forces with an increasing strategic footprint.

The relevance of aerospace power in the current and future threat environment cannot be overemphasised. India's capabilities in air mobility, heavy lift, Network-Centric Warfare (NCW), and the cyber and space domains have continued to grow at a reasonable pace. Therefore, aerospace power will contribute maximally as an instrument of military power, while the Indian Air Force (IAF) will provide the core competency in exploitation of such power, especially its offensive capability as an effective deterrence against a conflict being precipitated by adversaries.

Strategies and Doctrines

The envisaged capability of India's aerospace power has to be within the contours of the military strategy of the nation, which, in turn, would be governed by the National Security Strategy (NSS). Currently, we do not have a well formulated or documented policy/directive from the highest political authority. However, the Military Strategy (MS) is based on the Raksha Mantri's (RM's) Directive, issued from time to time. The currency of the directive often does not match with the transformed security environment due to the emergence of new potent threats. This aspect proves to be a handicap in working out a comprehensive plan or modifying the existing force structure plan and the Long-Term Integrated Perspective Plan (LTIPP) towards building an appropriate military response capability.

The three Services have worked out their respective 'doctrines', including the 'joint doctrine'. These doctrines provide the guidelines on roles, tasks,

composition, equipment, training and employment of the respective force to optimally fulfill its national obligations. This forms an important basic step for the employment of a professional fighting force, required to safeguard the sovereignty of land borders, maritime boundaries and aerospace frontiers.

The need for a well formulated higher level directive in terms of the NSS and MS has been highlighted by several 'Committees' and 'Study Groups' in the past. This is an area which requires the sustained involvement of the political leadership in analysing the threats to national security, the means to mitigate them, and the review of capability development plans. The exercise should be conducted on the lines of the annual Union budget, involving all the stakeholders and their endorsement, the principal agencies being the Ministry of Finance (MoF), Ministry of External Affairs (MEA), Ministry of Home Affairs (MHA) and Ministry of Defence (MoD). The sanction of the Cabinet Committee on Security (CCS) would provide greater institutional sanctity to the plans for implementation.

Evolution of Military Power

Historically, it is common knowledge that nations became great powers by demonstrating mastery over the creation, deployment and use of military power for achieving national objectives. It remains a vital and major component of Comprehensive National Power (CNP). CNP has a very wide canvas; the spectrum includes the state of the economy, human resources development, natural resources, science and technology base, development of core technologies through Research and Development (R&D) in the fields of nuclear, space, missile, electronic warfare, avionics, metallurgy, Information Technology (IT), etc to ensure strategic independence.

CNP ensures the comprehensive security of the nation. While CNP, without adequate military power, could still provide certain leverages (the carrot) to play a dominant role on the world stage, when backed up with potent military power (the stick), the world will respect India, especially the rogues and adversaries. Therefore, if India wants to play an important role in the international arena to protect its sovereign interests, there is no option but to invest adequately in building up its legitimate military power.

However, the composition of military power, especially its offensive elements like the strike corps of the Army, aircraft carriers and nuclear powered submarines of the Navy and heavyweight fighter / bomber aircraft of the Air Force could be determined through a logical analysis of the threats perceived

and their mitigation, the national objectives and aspirations, as well as the budgetary constraints.

Regional Security Environment

India has a volatile neighbourhood. Though Pakistan claims to be a member of the Global War on Terror (GWOT), its undeclared state policy of using terror for political ends and support to terrorist groups on its own soil, makes it obvious that it is 'running with the hares while hunting with the hounds'. The mindset of the Pakistan Army, especially after the debacle in the 1971 conflict, will not change in the near future. It will be driven by the urge to seek revenge, play up the bogey of India as an existential threat and maintain its indispensability in the Pakistani power equation through anti-India rhetoric.

Afghanistan may take more than a decade to stabilise. The increasing involvement of China in Afghanistan will be to stem the role and contribution of India while enhancing its own and that of Pakistan.

The destabilisation of Iraq and Syria, the rise of the Islamic State (IS), and the suffering of millions of displaced and conflict affected people of the region will have a long-term effect on the security environment and the final settlement of the turmoil. All these factors will impact the security of India as well.

An assertive China will be a major challenge to India's political and military leadership. The Chinese have turned aggressive, indulging in undiplomatic rhetoric bordering on threats against India. We should take notice of such aggressiveness and act appropriately for containing any undesirable contingency. There is a need to counter the growing perception that India is a pushover and may be bullied, thus, we have to be strong by building military capability. We should not expect other countries to help us directly in a contingency. The launching of the China-Pakistan Economic Corridor (CPEC) through Pakistan Occupied Kashmir (POK) has enhanced the prospect of a collusive threat to India and we must be able to deal with it effectively.

The spectrum of conflict has widened substantially. It encompasses sub-conventional (terrorist) attacks, conventional war and non-conventional (nuclear) conflict. While the probability of a full-fledged conventional conflict may have reduced, there is a rise in terror attacks. We have to, therefore, contend with the multi-dimensional threats by prioritising capability development against each type of threat.

National Objective and Aspirations

India desires peace and stability in the region. It is one of the fastest growing large economies, rapidly vaulting past many developed nations. It is important to maintain peace so as to ensure an uninterrupted steady trajectory of economic progress and improve the standard of living of its citizens. India is working dedicatedly towards economic and social development and integration of the region. It is destined to play an important role in maintaining peace and stability in the region and the world, with its democratic, multi-cultural, secular credentials and demographic dividend.

India's peaceful intentions are well enshrined in various declarations and charters like the 'Panchsheel', the Non-Aligned Movement (NAM) and the UN Charter. These have been propounded and adopted by India and provide the foundation of its foreign policy.

India has no territorial ambitions; however, it has been drawn into several conflicts since independence because of the legacy of the British rule, with unsettled border disputes. The frequent skirmishes at the Line of Control (LC), and Line of Actual Control (LAC) are constant reminders of the hostile environment at the borders which could erupt into a conflict, if not handled with firmness, backed by strength. Therefore, to deter a conflict, there is a need to build military capability commensurate with the threat environment, i.e, capability over the entire spectrum of threats, from terrorist attacks to nuclear sabre-rattling.

The desire to build a strong deterrent military capability will obviously be influenced by budgetary constraints. In the light of several competing demands between development and security, the emphasis will be on prioritisation based on urgency.

At the highest level, after due brainstorming on the NSS and MS, the National Military Objectives (NMOs) could be enunciated. The NMOs would be the foundational document for the creation of military capabilities to meet the objectives. It would not be difficult to finalise the LTIPP for the development of joint capabilities and individual Service capabilities, taking into consideration the budgetary support. To work out a viable capability development matrix, a minimum yearly growth percentage in the budgetary outlay would be essential, but for exceptional circumstances.

Military Power

All the three components of the military have vital roles to play in terms of both

defensive capability to safeguard India's sovereignty against an aggression as well as projecting offensive power for deterrence or inflicting heavy punishment in a conflict to achieve the desired end- state.

Land Forces

The Army must have adequate boots on the ground and integral firepower, especially armour, artillery and air defence to defend the land frontiers. The strength of offensive arms like the strike corps could be rationalised by analysing their employability in certain terrains and the overall military objectives of the nation in various contingencies. Enhancing surface-to-surface long and medium range rocket forces would provide a viable strike capability.

The Army must have certain elements of air assets integral to its formations. There is a need to be careful in avoiding duplication of assets, roles and inventory management, as far as possible. The focus on the conduct of land operations should remain, which is its core competency. The resolution of the turf battle on Attack Helicopters (AHs) between the Army and the Air Force through a government Directive in 2013, has enabled the Army to acquire AHs for deployment in the Tactical Battle Area (TBA), while Air Force assets would perform own specific tasks and augment the Army's effort in battle. The Counter Surface Force Operations (CSFOs) using all combat aircraft, irrespective of vintage, including the latest acquisitions, would be the most important campaign of the Air Force.

Maritime Domain

The maritime domain is gaining importance exponentially. It will continue to play a major role, be it in peace or war. India has no option but to dominate the Indian Ocean Region (IOR) for protecting its own interests and those of the littoral states. The Navy needs to strengthen its sub-surface weapon platforms substantially, both nuclear-powered and conventional submarines, while simultaneously adding powerful surface vessels to its fleet at sea. Anti-piracy and coastal-water defence against seaborne terrorist attacks, and anti-arms smuggling operations need concrete steps towards capability enhancement. The Indian Coast Guard and Indian Navy jointly would be required to take care of these threats to our long coastlines. It is perhaps one of the biggest challenges to our security in peace-time, since the coastal waters are porous and vulnerable. Rotary and fixed wing air assets would have to be augmented to fill the current voids in coastal surveillance.

The Navy's integral air power is growing rapidly with the induction of several Maritime Reconnaissance (MR) aircraft and planned induction of indigenous aircraft carriers. More MR aircraft are necessary for covering the entire IOR. While aircraft carriers are essential to project offensive air power using the maritime domain as the launch pad, as also the image or prestige of a powerful nation, their vulnerability and need for other naval assets for their own protection against aerial long range missiles and standoff weapons as well as sub-surface attacks should be considered in determining the optimum number of aircraft carriers in the fleet. There is a need to take into consideration the capability and effectiveness of shore-based combat aircraft in neutralising the envisaged threats vis-a-vis aircraft carrierborne air assets in our context, in determining the force mix. Loss of an aircraft carrier to enemy action in the early stages of a conflict could deal a severe blow to the morale of the forces and the nation.

Aerospace Domain

Recent conflicts have demonstrated the resounding success of aerospace power. It provides immense relief and freedom from surface friction inherent in land and sea operations. Its ability to interface, integrate and influence surface operations by providing a protective arm over own forces as well as launching offensive action against enemy forces to disrupt, delay, degrade and demoralise them before they join the battle, makes aerospace power the war-winning factor. Thus, without the effective use of aerospace power, surface operations may not achieve success in a conflict, and, in fact, may render them very vulnerable to enemy air action. Victory in war without air dominance would be difficult. There is a very compelling case for developing strong aerospace power, which will provide the most efficient striking or offensive power. Such power helps us to take the war to the enemy, hence, is an effective deterrence against conflicts.

The IAF has been entrusted with definite roles and responsibilities in ensuring the sovereignty of the aerospace frontiers of the mainland and island territories. Over several decades, it has built up certain core competencies in exploiting aerospace power for both peace-time and war-time contingencies. An aerospace strategy can be formulated effectively and accurately in the light of the envisaged roles and responsibilities of the Air Force, highlighted in the 'Union War Book'. There are three broad categories of classical roles being performed by the IAF. These are: protection, deterrence and projection of the strategic footprint in the region, in addition to other miscellaneous peace-time roles.

Protection: This is an air defence task being undertaken 24 x 7 to protect the sovereignty of the aerospace frontiers. Surveillance radars, communication networks, Integrated Air Command and Control System (IACCS), armed combat aircraft and helicopters, and Surface-to-Air Guided missile (SAGW) are always at readiness for combat action. There is a continuous interface with the Army and Navy, but mainly with the civil aviation authorities to control more than 6,000 civil flights and nearly 1,500 military flights daily, flying in the Indian air space. Early operationalisation and integration of the Air Defence (AD) networks of the Navy and the Army with the IACCS would provide true Network-Centric Warfare (NCW) capability to the armed forces in performing AD tasks round the clock. However, the challenge remains in monitoring unregulated flights of gliders, microlites, Unmanned Aerial Vehicles (UAVs), drones, large balloons, etc to ensure flight safety of manned aircraft and prevent misuse of these airborne vehicles by terrorists. Early promulgation of regulations by the Ministry of Civil Aviation (MoCA) and their implementation by the MHA, MoD and MoCA remains a Key Result Area (KRA) for the government.

Deterrence: The IAF has been reasonably strong throughout the last five decades, barring the first two decades after independence. In the 1962 and 1965 conflicts, air power was not fully exploited for various reasons and we could not deter the adversaries. However, rapid build-up of combat aircraft potential, excellent jointmanship and sustained offensives by air, land and sea helped us win the 1971 conflict in an unprecedented manner. Ever since, the IAF has retained substantial combat potential, especially offensive capability to deter our adversaries from precipitating a conflict. Induction of several combat aircraft fleets like the SU-30 MKI, Mirage-2000, MiG-29, Jaguar, Beyond Visual Range (BVR) air-to-air missiles, and Precision Guided Munitions (PGMs) with substantial standoff ranges has ushered in a technological and numerical edge in our offensive capability. If the Kargil conflict did not blow up into a full-fledged conventional war, it was due to the IAF's distinctive edge over the Pakistan Air Force (PAF) that played a vital role in deterring the adversary. However, rapid modernisation of combat aircraft fleets and Surface-to-Surface Missiles (SSMs) in the neighbourhood and simultaneous decline in the combat assets of the IAF is likely to tilt the existing balance unfavourably. India's aerospace strategy should envisage early induction of modern combat aircraft to bring it up to its sanctioned strength, with force enhancers like Flight Refuelling Aircraft (FRA), Intelligence, Surveillance, Targeting and Reconnaissance (ISTAR) aircraft, Airborne Warning and Control System (AWACS), Airborne Early Warning

and Control (AEW&C), S-400 AD missiles, etc in adequate numbers to fill the existing voids and restore the combat edge of the IAF.

Projection of Strategic Footprint: Induction of the SU-30 MKI, Mirage-2000, AWACS and FRA has enhanced the power projection potential. But, more importantly, the acquisition of the C-17, C-130 and a large number of Medium Lift Helicopters (MLHs) has made the IAF the first responder in peace-time and conflict related contingencies, both abroad and at home. In the Humanitarian Assistance and Disaster Relief (HADR) operations undertaken by India in Nepal (earthquake) for over a month, overnight drinking water supply to Maldives, aid to Sri Lanka (floods), Fiji (cyclone), etc, the IAF had a major role in expeditious deployment and prompt conduct of operations. Similarly, the IAF's large bodied transport aircraft evacuated the Indian diaspora and other nationals from conflict-ridden South Sudan and war-torn Yemen (via Djibouti), projecting the strategic footprint of the country. HADR operations by India have enhanced its image and showcased the professionalism of its armed forces. India is being recognised as a leader in the conduct of HADR operations in the region, buttressed by its air assets, helping in rapid deployments.

Peace-time Roles: Besides the 24x7 air defence role that the IAF has been undertaking, which normally goes unnoticed by the countrymen, it has remained relevant to the people and the government by conducting various missions in aid to civil authorities. The IAF's transport and helicopter fleets have been pressed into immediate service during natural disasters like severe floods, cyclones, earthquakes, and conducting intensive HADR operations. It has come to the aid of the authorities to douse forest fires, deploy the security forces, election officials and Electronic Voting Machines (EVMs) during the general elections for the smooth conduct of elections. More importantly, the IAF helicopters have been providing logistics support to the police forces round the clock for the last several years in stemming the Naxal activities in many states. Another very critical task that the IAF performs round the year is of providing an uninterrupted supply chain to the Army, Indo-Tibetan Border Police (ITBP), Border Security Force (BSF) and other state/civilian agencies through air maintenance sorties by fixed wing and rotary wing aircraft in the mountainous regions. In recent times, the IAF flew several hundred helicopter sorties to airlift police and Army personnel to control the civil agitation in Haryana and numerous heavy lift aircraft to Jammu and Kashmir (J&K), as also to help the central government in airlifting hundreds of tonnes of bank notes from mints to various parts of the country to rapidly ease the effects of

demonetisation. To fulfill these tasks efficiently, the IAF has been well endowed in terms of fixed wing and rotary wing aircraft in its inventory, consequent to smart and logical procurement decisions. This is another KRA wherein the government needs to sustain such air assets for air mobility and heavy lift capacity as a part of the air strategy. These assets are extremely important during mobilisation and actual conduct of operations while they perform yeoman's service for the nation, round the year.

Aerospace Strategy

India's aerospace strategy would be within the realms of the overall military strategy to transform the armed forces into a multi-spectrum strategic force. Land and naval forces historically operated independently, using their own 'medium' until the advent of aerospace power. It is aerospace power which enables them to sustain operations beyond their physical operating medium for success in any operational campaign. Therefore, the aerospace strategy and its application would encompass the Air Force, Army and Navy in general and provide for optimal integration towards the overall and individual campaigns.

The important aspects of the aerospace domain which would require focussed attention to strengthen aerospace power are implementation of a long-term transformation plan, network-centric warfare capability, creation of operational infrastructure, security of air bases, professional training of human resources, a viable maintenance and inventory management philosophy, impetus to indigenisation to achieve strategic independence, revamping of the acquisition process of the MoD, use of aerospace power towards projection of the nation's image, its vital role in joint operations and improvement in the teeth-to-tail ratio.

Transformation Plan

Aerospace assets are technology intensive, making use of state-of-the-art equipment. Their shelf-life is limited and, hence, operations are faced with problems of obsolescence. The universally accepted strategy is three-pronged to deal with the problem.

Firstly, preserve the legacy equipment till the replacements arrive. It requires sustained effort and time, and, of course, the penalty would be partial loss of capability because of their vintage, especially when pitted against the latest equipment / weapon system in use. The armed forces continue to operate Chetak helicopters despite their vintage since no replacements have come

about, while the IAF has several vintage MiG- 21 squadrons continuing to fly due to delays in fresh acquisition of modern fighters.

Secondly, carry out mid-life upgrade of fleets and equipment to enhance technical life and improve operational relevance. The IAF has successfully effected mid-life upgrade on the Mirage-2000, MiG-29, Jaguar and AN-32 aircraft for enhanced operational capability as also increased operational life.

Thirdly, acquire the latest weapon platforms and equipment to replace the old hardware to enhance capability. Induction of new aircraft like the Rafale, Light Combat Aircraft (LCA), and Fifth Generation Fighter Aircraft (FGFA) would replace obsolete fighters as also enhance the IAF's combat potential. However, these replacements need to make quick strides.

Acquisition of the Light Combat Helicopter (LCH) and Advance Light Helicopter (ALH) in large numbers by the Army would substantially enhance its air element capability, while induction of a large number of P-81 Maritime Reconnaissance (MR) aircraft by the Navy has been a case of replacement-cum-enhancement of MR capacity.

Induction of 10 x C-17 heavy lift and two squadrons of C-130 special operations aircraft has been an excellent strategic decision. It has shortened the timelines for air mobilisation of forces in both war and peace. The C-130 fleet has provided the armed forces with tremendous capability for conducting special operations, which is a feather in the cap of our offensive power.

Induction of medium lift helicopters in large numbers and addition of heavy lift helicopters in the inventory has improved the IAF's capacity for conducting rapid and extensive HADR operations, as also sustaining the Army and other forces in difficult terrain through air maintenance. Helicopters are being used extensively by the government for multifarious activities to serve the people. Rapid mobilisation in mountains, like Inter-Valley Troop Transfer (IVTT) using these helicopters is a boon for the formation commanders of the Army deployed in the hills.

Force enhancers like the AWACS, AEW&C, FRA, ISTAR, UCAV (Unmanned Combat Air Vehicle) are campaign winning assets which will multiply the effectiveness of other combat platforms several notches higher, including those which have turned vintage. A good mix of force enhancers is absolutely essential to achieve air dominance to win campaigns. The UAVs and UCAVs in adequate numbers would provide the technological edge and capability to effectively deal with terrorists and other sub-conventional threats.

Induction of the Rafale with the Meteor Beyond Visual Range (BVR) air-to-air missiles and Active Electronically Scanned Array (AESA) radar will certainly assist in dominating the air. Similarly, the air-to-ground Precision Guided Munitions (PGMs) with long standoff ranges will be devastating in engaging ground targets with precision. The combat fleet under induction or upgrade (SU-30) needs to have such capabilities.

Our strategy with respect to combat aircraft would to have be a reasonable mix of heavy (SU-30 class), medium (Rafale class) and lightweight (LCA class) fighter aircraft with the latest radar, weapons and electronic warfare suite. While the heavyweight fighters would obviously be twin-engined, it would be desirable to have mediumweight fighters also with twin engines for various tactical, environmental, flight safety and survival reasons. Inventory management would be easy and less expensive if the number of the types of aircraft is limited to a few, preferably not more than five. Induction of a bomber squadron for the Strategic Command would be essential. Ground-based Air Defence (AD) weapons acquisition has been a tri-Services integrated plan, and rightfully so. The strategy for acquisition and deployment of AD missiles is highlighted below.

Acquisition of the Long Range Surface-to-Air Missiles (LRSAM) of the S-400 class would form the offensive component of SAGW to engage distant targets. Other tiers would be provided by the Medium Range Surface-to-Air Missile (MRSAM) and Close in Weapon System (CIWS). In general, two and in exceptional cases, three tiers of missile defence would be adequate for any Vital Area (VA)/Vital Point (VP).

Area defence would be provided by the LRSAM and MRSAM, while CIWS would provide point defence, which would also be effective against sub-conventional aerial threats.

The types of missile systems should be limited and common for deployment on land for cost-effective and efficient inventory management. In addition, the Army strike elements may require the Very Short Range Air Defence System (VSHORADS) instead of CIWS, while the naval ships would have AD missiles catering to specific characteristics of the maritime environment.

Network-Centric Warfare

Network-Centric Warfare (NCW) capability will determine the outcome of future conflicts. Networking assists in rapid decision-making, thus, reducing the 'sensor to shooter' time. Near real-time information and data flow from all agencies,

sensors, platforms, etc in a synthesised, ready to use form to the commanders at all levels would translate into significantly enhanced combat capability. This informational advantage of situational awareness in decision-making will assist in remaining well ahead of the adversary at each stage of the operational engagement. Net-centricity has the maximum impact on exploitation of aerospace power. There are three networks which require integration in real-time to provide the NCW capability: terrestrial, airborne and space-based networks. The terrestrial network with Optical Fiber Cable (OFC), Light of Sight (LOS) and satcom overlays are robust systems for individual Service and tri-Services operations. The airborne network would be completed with the Operational Data Link (ODL) in place, while the space-based assets' deployment programme has progressed well to complete the triad of networks necessary for efficient network-centric operations. The success of terrestrial networks of the Army, Navy and AF (AFNET) and operationalisation of IACCS nodes in several sectors by the IAF and integration of AWACS / AEW&C has made the IAF NCW capable. Emphasis on early completion of the AD networks of the Navy and Army, expeditious operationalisation of ODL and space- based network comprise the strategic requirements for military capability for the future.

Operational Infrastructure

Air operations are infrastructure intensive. Runways, manoeuvring areas, tarmacs, hardened aircraft shelters, weapon storage areas, Electronic Warfare (EW) and avionics laboratories and hangars comprise some of the infrastructure necessary for the conduct of maintenance, training and operations.

The creation of these assets is time consuming and capital intensive. A big chunk of the revenue budget is required for its regular maintenance, repair and upkeep. The Engineer-in-Chief's (E-in-C's) Branch and the Military Engineering Service (MES) have not been able to deliver adequately in the creation of such fund-intensive special infrastructure to the IAF. The time and cost overruns are enormous. The construction technologies and techniques used are not world-class, and quality control is deficient as they lack expertise and experienced personnel. As a strategy, there is a need to create a more permanent and efficient organisation, managed by professional experts to deliver high quality infrastructure for aerospace operations, avoiding loss of operational capability due to time overruns.

Based on the IAF's initiative to commission several stretches of highways and expressways for conducting flying operations, the central government has

formalised a standard plan to build such stretches of roads all across the country. These strips would be strengthened to cater to the specific requirements of the IAF's air operations. The implementation of this strategic decision would provide immense flexibility, dispersed operations and survivability of air assets during operational contingencies.

The sanction of the government to upgrade the operational infrastructure in the northeast (NE) and Leh-Ladakh sector, and the recent completion of some of these projects has already enhanced air operations in these regions. Such initiatives not only improve connectivity, tourism, job creation, economic development and integration of remote areas with the rest of the country, but also serve to achieve strategic security dividends.

Security of Air Bases

Air operations are base dependent, which provide extensive infrastructure and are populated with expensive air assets as well as expert professionals. In recent times, air bases have been targeted by well armed, trained and motivated terrorists. In our neighborhood, several such attacks by terrorists have resulted in the destruction of valuable assets at air bases. The attack on the Pathankot air base, close to the IB, the *modus operandi* of the attackers, the use of technology in the final detection of the intruders and their neutralisation brought into focus various lessons for the IAF/armed forces and the government. The corrective actions include strengthening of boundary walls with smart fence technology, tiered intrusion detection system, central monitoring, and Quick Reaction Teams (QRTs) for timely neutralisation of the threat. Obviously, better weapons, equipment including Night Vision Devices (NVDs) and enhanced training of personnel need to be in place at the earliest. As a policy, funds must be available on priority for the creation of the security infrastructure against sub-conventional threats.

Human Resources

Human resources are the most vital assets of any organisation. This maxim is most significant in the exploitation of aerospace power, where they have to master and deal with cutting edge, state-of-the-art technologies.

The demands on the IAF and its air warriors multiply several fold when it comes to training, taking into account the complexity of equipment/ weapon platform inventories, sourced from the US, Europe, Russia as well as indigenously, their differing operation, exploitation and maintenance

philosophies as well as inter-operability issues. The unique terrain and climatic conditions in the subcontinent also demand exposure and varied training for optimal performance.

The air warriors fight as good as they train. Therefore, the training policy must cater for induction of high quality individuals, excellent state-of-the-art training facilities, most appropriate types of training aircraft fleets ensuring progressive flying skill development, availability of modern simulators and virtual training systems. The tendency to cut costs in setting up training infrastructure and equipment would jeopardise the professional capability of the force to deliver the goods in actual operations.

Maintaining the high morale of the human resource and the retention of highly qualified personnel in service may be assured by providing a good standard of living and high quality of life. Infrastructure must be created to ensure a good work environment, living accommodation, sports, entertainment, education and medical facilities. Incentive schemes are essential for a longer retention period of good professionals, especially in critical domains.

Maintenance Philosophy

Aerospace power projection is related directly to the availability and mission capability of its war- fighting assets. This, in turn, is a function of serviceability, system reliability and techno-logistic support base. Maintenance costs are high because of the repair, overhaul and replacement expense, infrastructure demands and the need for skilled technical personnel.

To achieve high serviceability and maximum utilisation rate of weapon systems, the strategy should cater for life-cycle management, Performance Based Logistics (PBL), and timely procurement of spares and aggregates. Hindustan Aeronautics Limited (HAL)/Bharat Electronics Limited (BEL) should be considered as the Original Equipment Manufacturers (OEMs) for all equipment supplied under licence or otherwise and be bound by clauses like PBL and minimum assured serviceability of equipment.

The task of the IAF Base Repair Depots (BRDs) and Equipment Depots (EDs) should be reviewed, with greater responsibility being shared by the Defence Public Sector Undertakings (DPSUs) and indigenous manufacturers. Selective, critical tasks should be retained with the BRDs and EDs, while most of the overhaul, repair and supply chain management could be outsourced to appropriate DPSUs and reputed industry. A similar action plan should be formulated for Army and naval aviation assets.

Strategic Independence Through Indigenisation

A nation can achieve true strategic independence only if it develops the capacity to create and absorb critical technologies in fields such as nuclear, aerospace electronics, weaponry, etc.

At the time of independence, our leaders were great statesmen with a vision for India to be self-reliant in every sphere. They displayed far-sightedness by establishing the Department of Atomic Energy (DAE), Indian Space Research Organisation (ISRO), Defence Research and Development Organisation (DRDO), Defence Public Sector Undertakings (DPSU), PSUs and such other institutions like Indian Institutes of Technology (IITs) to develop India into a strong nation. In some of the fields, India has achieved great success. The achievements of the ISRO, DAE and DRDO-driven Integrated Guided Missile Development Programme have been world-class, which makes us feel proud. However, DRDO, as a whole, with several research laboratories, has not fully lived up to the expectations of the nation. It could not succeed in developing many critical technologies for mass production by the DPSUs to meet the requirements of the armed forces. HAL, BEL, BDL (Bharat Dynamics Limited) and other DPSUs have concentrated more on mastering the art of licensed production of military hardware sourced from abroad, displaying inadequate hunger for R&D and self-reliance. This narrative must change sooner rather than later.

The DRDO and DPSUs are strategic assets of the nation. Their mandate is absolutely clear, yet India remains one of the leading importers of military hardware, a stigma no powerful and proud nation can swallow. These establishments need more professional management and outcome driven strategy to overcome the excessive time and cost overruns and deficiency in leadership. It is unfortunate that the nation has withheld its private sector from participating in defence sector manufacturing of military hardware. The monopoly of the DRDO and DPSUs in setting up and running the military industrial complex, and lack of professional management are the root causes of our loss of strategic independence. The government needs to revamp the entire DRDO/DPSUs structure and policies to achieve the stated national goals. The overhaul of the Defence Procurement Policy (DPP), implementation of the 'Strategic Partners' concept, a greater role of a well-established private sector and the Make in India initiative are necessary to achieve self-reliance in defence production. The aerospace industry in our country is at a nascent stage. It has tremendous potential for growth in keeping with the exponential

expansion of civil aviation, and the existing voids in the aerospace assets of the armed forces, to be filled and future enhancements required. India should turn itself into an aviation industry hub in Asia to meet its own requirements and that of the region in terms of manufacture as well as Maintenance, Repair and Overhaul (MRO) facilities. The time is ideal for seeking collaboration with foreign manufacturers for true Transfer of Technologies (TOT) in key areas and setting up shop, ensuring long-term benefits for India.

Acquisition Process

The biggest stumbling block in building military capability is the acquisition process itself. The procedure to acquire military hardware followed by the MoD is too long and complicated, with tiers of stakeholders exercising oversight, often without much accountability and understanding of the strategic needs of the nation. The process is not outcome-oriented; the most important stakeholder, the finance department, looks at the procurement case as a pure commercial activity and not as a strategic requirement. The emphasis in the government agencies is on the 'process' and not the 'outcome'. To overcome the shortcomings of the current acquisition process, there is a need to formalise or revamp institutional Standard Operating Procedures (SOPs), hold collegiate meetings of all the stakeholders in a time-bound fashion and achieve the desired outcome. The decision to acquire a particular type of military hardware, out of many choices, is a strategic one, and often political and diplomatic considerations may outweigh the commercial aspect, provided the equipment meets the basic capabilities. The executive should not hesitate in making such decisions when the logic is clear and the resultant benefits are well articulated.

There is a fear psychosis amongst many stakeholders in recommending acquisition of specific equipment because of the vitiated environment, with several scams and investigations which involve past decision-makers. Not many are ready to shoulder the responsibility that goes with their appointment, displaying lack of integrity. This has resulted in unusual delays in procurement of equipment, surrender of funds, associated loss of operational capability as well as loss of confidence in the procurement process.

Image Projection and Perception Shaping

Use of aerospace power is vital in projecting the image of the nation, the perception of our own people about its capability as well as the international reputation as a leading nation with highly professional armed forces. India's

armed forces have already excelled in the conduct of HADR operations across the world. The rapid response of India in such contingencies, which has caught the attention of the world, has been achieved through the deployment of air assets. Similarly, air assets deployment in UN missions and their professional exploits have earned laurels for India.

International cooperation through bilateral and multilateral air exercises with nations in the neighbourhood and all the important professional Air Forces of the world has established the preeminence of the IAF as a vibrant professional force. The footprint has increased manifold, from engaging barely four countries between 1995 and 2005 to eight countries in the last decade, 2006-2015. This engagement would increase to a whopping 32 countries in the current decade. The performance of the IAF in all such exercises has been outstanding: the counterparts in powerful nations like the US, UK, Russia, France, etc acknowledge the high professional capabilities of the IAF and are always looking forward to such exercises with India. Military diplomacy is a very important pillar of the overall diplomacy of the nation. We lack the presence of Indian military attaches in many important countries. The government would do well to enhance the number of military attaches abroad for greater effectiveness of our diplomacy. This is a strategic investment India has to make in furtherance of our claim as a regional power or a growing international player. The proposal should not be given a burial under 'turf' considerations.

Joint Operations

The IAF is solely composed of aerospace elements in projecting the nation's military power. However, aerospace power application is the common binding glue which binds the other two Services – the Army and Navy – to the IAF for success in operations. Therefore, the Services have to organise, equip, maintain and train for joint operations, from *ab-initio* planning to final execution of operational plans. The ethos of jointness amongst the three Services has to be ingrained right from the beginning and reemphasised at every stage of training in each Service.

There is a need for providing a stong impetus to jointness, may be, top down, to ensure due importance of the issue. Turf battles amongst the Services would reduce substantially, if tenanting appointments in joint formations and organisations, at both Staff and Command positions, count towards career progression to higher ranks. The personnel who have served in tri-Services organisations and other joint institutions like the Headquarters Integrated

Defence Staff (HQ IDS), Andaman and Nicobar Command (ANC), Strategic Forces Command (SFC), National Defence College (NDC), College of Defence Management (CDM), Defence Services Staff College (DSSC), National Defence Academy (NDA), etc., will vouch for the changed perception amongst them on the need to avoid turf battles and work for jointness.

Space is a continuum of the air and no demarcation is desirable, especially for the defence of the aerospace frontiers, against both air-breathing missiles and weapons, as well as ballistic missiles using the medium of space. Command and control should remain preferably with a single agency which has the core competency as also the AD assets, including Anti-Ballistic Missile (ABM) defence, to implement the surveillance and control mechanism. Since space has other applications in terms of navigation, intelligence, surveillance, reconnaissance, etc, as well as offensive capabilities, there is a need for the government to create a Tri-Services Space Command, led preferably by an air warrior commander under the Chairman Chief of Staff Committee (COSC). This will assist in the execution of AD tasks, especially against ballistic missiles through the integration of air and space surveillance assets and networks, as also provide the space-based services to the Army, Navy and Air Force.

Similarly, the cyber domain has turned critical for the overall security of the nation's economic, industrial, Information Technology/ Information Technology Enabled Services (IT/ITES), communication networks and day-to-day commercial activities of citizens. The cyber domain operates in the air and space medium. In the overall structure for cyber security, the creation of a Tri-Services Cyber Command is absolutely essential. There is a need to replicate the features of many of the advanced armed forces in creating the Cyber Command at the earliest, since we are falling behind in cyber warfare.

Creation of a permanent chairman, COSC, or the Chief of Defence Staff (CDS) would bolster the existing impetus to jointness. The hands of the Chairman, COSC, are already full with the SFC, ANC, HQ IDS, joint training establishments, National Defence University (NDU), tri-Services procurements, joint communication, conduct of HADR operations coming under his charge. Wearing two hats, that of a Service Chief and of Chairman, COSC, does not allow him to do justice to these extremely important jobs. It is an undesirable situation which is not being rectified despite repeated reminders by several competent committees in the past. The sheer inertia and status quo attitude will cause great harm to jointness amongst the Services and the overall military capability.

Teeth-to-Tail Ratio

The world over, the armed forces are being downsized to become lean and mean, while retaining operational capabilities by removing the flab so as to improve the teeth-to-tail ratio.

Aerospace power is directly dependent on the quality of its equipment and the professionalism of its trained personnel. Identification of non- productive units and manpower assets is not difficult and such review is undertaken regularly to overcome shortages in new areas. The use of IT, computerisation, digitisation and automation in almost every activity is effectively reducing the need for working hands. Introduction of the Integrated Material Management On-Line System (IMMOLS) and Electronic Maintenance Management System (e-MMS) would help in reducing paperwork and, hence, the need for the full complement of manpower. Outsourcing a number of activities which are non-critical for operations and maintenance would help in downsizing the manpower.

However, since the IAF is expanding, its new weapons inventory and platforms like the C-17, C-130, aerostat units, additional SAGW, radar units, UAVs, etc, the endeavour would be to redeploy the sanctioned manpower rationally in the new areas thereby cutting down on the net increase in the overall strength. Currently, the teeth-to-tail ratio in the employment of aerospace power is quite favourable, which would require fine-tuning, based on the above mentioned facts.

War-fighting in Conventional Conflict

In the worst-case scenario, India may have to deal simultaneously with more than one adversary. Air operations will involve overcoming the challenging and varied terrain and climatic conditions, especially in the mountainous regions. Stationing air assets like fighter, transport, helicopter, force multipliers, SAGW and radar units in the area of interest is a well-established policy of the Air Force. This deployment pattern allows not only the aircrew and combat crew to train realistically all year round in a designated theatre, but also provides exposure to other air warriors in the maintenance of war-fighting equipment and weapon platforms in unique climatic and environmental conditions. It helps in establishing reliability and equipment performance criteria as also familiarity with operations and a higher confidence level amongst war-fighters.

Alternatively, operational assets stationed in depth or other theatres, to facilitate peace-time training while overcoming air space availability constraints,

are deployed regularly in the designated actual area of interest for operational familiarisation and training. Such deployment of forces is obviously less than ideal. Therefore, role-oriented training in a specific theatre, especially of the war-fighting crew as well as deployment of adequate combat assets would be crucial in winning the air war.

To cater for multi-front engagement, it is essential to rapidly build up the combat aircraft force level to 42 squadrons, as sanctioned by the Parliament some time back. It is logical that a substantial component of the fighter fleet needs to be of the twin-engine, heavy and medium weight variety, for operational and safety reasons.

The mountainous region has large shadow areas due to the masking effect of undulating terrain which adversely affects the performance of ground-based radars for the surveillance of the air space. Therefore, airborne sensors and control aircraft like AWACS, AEW&C and ISTAR would have to be deployed round the clock for successful conduct of air defence and offensive operations.

Enhancement in the inventory of force-multipliers like AWACS, AEW&C, ISTAR, FRA, etc is an absolute necessity to win the air-domination battle, as also to compensate for the lack of adequate combat assets and improve the effectiveness of vintage fighter fleets. These assets cannot be considered an add-on capability since they form a vital ingredient of the core combat capability, especially when our adversaries are well ahead in operationalising such assets in larger numbers.

Rapid mobilisation and redeployment of forces would be essential in a multi-front engagement. This would be achieved with large-bodied transport aircraft like the C-17, IL-76 and civil aviation assets duly requisitioned by the government. A large fleet of medium and heavy lift helicopters would be of immense help in Army operations. Vertical envelopment, resupply by air, and inter-valley troop transfers would play a decisive role in winning battles by increasing the tempo of operations. The IAF has already achieved the capacity to conduct brigade level airborne operations in one wave.

In the mountainous regions, the IAF would have to concentrate mostly on the Counter Surface Force Operations (CSFO) campaign, involving interdiction of lines of logistic supply and reinforcements as well as robust support-to-surface forces in battle. The SOPs for dynamic targeting should be upgraded with enhanced NCW capability for improved response time. All types of fighter aircraft with exceptional ground attack capability would be involved in the

CSFO campaign. The IAF needs to reassure the Army on this aspect during joint planning of operations.

Joint planning and conduct of operations, especially with the Army would be the key to our success. The 1971 operations comprise a good template to understand the effectiveness of joint operations and the finer points of joint planning. Contingency planning would require a joint targeting plan, prioritisation of targets to be engaged, means and methodology to be adopted and incisive intelligence on target systems. While peace-time target intelligence, gathered over a period of time and updated regularly is adequate for pre-planned engagement of targets, real-time intelligence for dynamic targeting would remain a challenge to be addressed during a conflict. Our focus should be on enhancing satellite surveillance of the target area 24x7, as well as acquiring more strategic and tactical assets (platforms with SAR, IR, EO pods and GES) to provide near real-time intelligence, especially of the TBA. Availability of ISTAR aircraft would resolve many of the challenges of the CSFO campaign.

Dispersal of air assets would be essential to counter the Surface-ti-Surface Missile (SSM) threat. Flying units would have to operate several detachments from dispersed locations which would entail catering for additional ground handling and servicing equipment.

In any future conflict, 24x7, day and night operations involving long duration sorties would take a toll on the aircrew due to fatigue. The cockpit-to-pilot ratio in such an environment of fast paced air operations needs to be enhanced to 1:2, an accepted figure maintained by most advanced Air Forces in the world.

The Navy would have a huge task, especially in multi-front engagements to dominate the seas. Its carrierborne air assets would not be adequate to engage targets of opportunity over such a large area of responsibility. The land-based maritime air elements of the IAF like the Jaguar, SU-30 and the later Rafale aircraft would be very effective in meeting offensive operational tasks in the maritime domain. It would obviously involve integrated planning and execution at Service HQ and Operational Commands, including the ANC.

Summary

The aerospace capability of a nation determines its strategic reach or footprint to a very large extent. It is the leading edge of military power and an indispensible factor for success in war. The offensive strength in aerospace power determines the degree of deterrence it provides against formidable adversaries to sustain

peace and tranquillity in the region. The essential steps for a comprehensive aerospace capability development are summarised below.

National security structures institutionally are already in place, however, there is a need to strengthen the mechanism of their functioning. The highest authority of the nation is required to define the national security strategy and enunciate the military strategy as a sub-set of the overall strategy. Based on these two strategies and the resultant military objectives, the capability matrix and LTIPP need to be finalised and implemented for the armed forces in a time-bound fashion. An annual review of planned enhancements undertaken at the highest level, and initiation of vigorous remedial actions would provide the desired 'outcomes'. The most important factor in achieving the outcomes is appropriate and assured budgetary support for acquisition and revenue expenditures. The following are some recommendations:

Provide adequate and appropriate aerospace elements for the Army, Navy and Indian Coast Guard (ICG) in keeping with their roles and tasks. The approach should be logical, avoiding duplication of assets, material and maintenance management aspects, where possible. The fundamental principles should be exploitation of aerospace assets by the stakeholders, with core competencies and synergised aerospace management for efficient command and control. Enhanced blue-water maritime reconnaissance capability for the Navy and coastal water surveillance for the ICG are essential to tackle conventional war-time threats, as well as sub-conventional threats.

Expedite the operationalisation and integration of the air defence networks of Army, Navy with the IACCS of the Air Force for achieving true and efficient NCW capability in AD functions over the entire aerospace of subcontinental India and island territories. Early promulgation of appropriate 'regulations' by MoCA and their implementation need to be ensured to take care of threats from unregulated flying machines and objects.

Approval of a coherent plan by the CCS for timely acquisition of modern combat aircraft assets to fill the voids is necessary. It would help build up to the sanctioned strength to revive the technological and numerical edge. The types of aircraft should be restricted for efficient inventory management and interoperability considerations. A bomber squadron for the SFC is essential to enhance the capability of the air vector. Greater emphasis is required on enhancing the SSM(conventional) capability.

Enhance the fleet of AWACS, AEW &C and FRA ; acquire ISTAR, UCAV and EW equipment for improved exploitation of war-fighting assets. These

provide war-winning capability through effective air dominance. UCAVs would play an important role against sub-conventional threats.

Sustain the excellent air mobility and heavy lift capability for maximising peace-time roles, especially HADR and aid to civil authorities. It showcases the professionalism of the armed forces and projects the image of India internationally.

Procurement of SAGW for the AD of VAs/VPs should be rationalised for the armed forces as a whole, avoiding overkill and for better inventory management, training and maintenance of assets. The Anti-Ballistic Missile (ABM) defence system needs to be operationalised and integrated with the conventional AD network.

All the networks i.e., space-based (with a full complement of satellites), airborne (ODL) and terrestrial, need early operationalisation since NCW capability is a strategic requirement.

Creation of infrastructure for air operations requires better professional management, use of world-class technologies and techniques. The role of the E-in-C's Branch, especially of the MES needs a review in this regard. The National Highways Authority of India (NHAI) needs to follow up on policy to create several stretches of expressways and highways for air operations during contingencies.

The security infrastructure for air bases vulnerable to terrorist attacks needs early enhancements through appropriate budgetary support.

World class training assets and infrastructure in terms of aircraft, simulators, virtual training systems need to be established for developing high quality human resources to maximally exploit the state-of-the-art weapon platforms and equipment in the aerospace domain.

India needs to follow a vigorous policy to achieve strategic independence through indigenisation. The tasking of DRDO and DPSUs has to be reviewed for developing core technologies and indigenous production without time and cost overruns. The role of the private sector should be enhanced through implementation of the 'Strategic Partner' concept. Efforts are required to set up an aviation hub in India for manufacturing and MRO facilities for aircraft and equipment. A roadmap needs to be prepared for indigenous production of all critical aerospace military hardware for vigorous implementation. The ISRO, which has made giant strides in making India a strategic space power, could be the model to be replicated by the DRDO and DPSUs for the development of indigenous military capabilities.

Streamlining the acquisition process of military hardware is essential so that it becomes 'outcome-driven' and not 'process-driven'.

Provide an impetus to military diplomacy by conducting more international exercises and enhancing the role of defence attaches in our missions abroad.

Aerospace power is the best binder in joint operations. The success in any campaign will be determined by the effective use of the third dimension. The impetus to jointness has to be top-driven and exposure of officers in joint organisations is essential for career growth to the higher level. Tri-Services Space and Cyber Commands need to be established at the earliest to integrate these new domains in our war-fighting capabilities.

Creation of the CDS or Permanent Chairman, COSC, is absolutely essential to bolster jointness and maximise the military power of the nation.

Downsizing of forces is inevitable with automation, digitisation, computerisation and e-management of material and maintenance activities. However, the emphasis needs to be laid on improving the teeth-to-tail ratio and not downsizing alone.