FUTURE SHAPE, SIZE AND ROLE OF INDIAN AIR FORCE

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Determining and suggesting the future shape and size of a large air force is a very complex process and requires a multi-disciplined team to go through the multi-faceted deliberations. Even after a systematic, and perhaps, a scientific study, the result has to have built-in flexibility to meet many unforeseen situations. Even though some people may call this process 'crystal gazing', this activity is undertaken not only in the Indian Air Force (IAF), but world-wide, both officially and in the open literature. The study involves a number of imponderables like the numbers, weight categories, quality, technology/ generation levels, time-frames, replacement / upgrade plans of aircraft and other combat support equipment, besides politics, which do not permit finalisation and unanimity. Most of the time, the discussion centres on fighter aircraft but the other combat support equipment, which sharpens the teeth, is glossed over. If we look at the recent inductions, it is evident that the IAF is certainly focussed on the two most important factors i.e. strategic reach and joint operations in our scenario, keeping in mind the greater role expected to be played by India in the future. It is our government that needs to be convinced of our requirement of aircraft and other combat support equipment during peace-time in order to be prepared for war. Are we sure that a 55-

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squadron force will be enough and what will be the requirement of support aircraft and other equipment to win the future wars?

There are a number of variables which impinge upon the security situation and, consequently, the kind of tasks the military is likely to be called upon to perform. Who could have visualised the end of the Cold War, Gulf and Iraq War, and the unification/ break-ups in Eastern Europe when outwardly the conditions were stable? In our neighbourhood, the geo-political situation has been in a state of flux for over 50 years, with nations alternating between democracy and autocracy, and externally having to deal with the leftover problems of partition and boundary disputes. In the past, there has been instability, strife and conflict, and a number of wars have been fought between the neighbours but the present security situation is changing with relative peace at the Line of Control/ Line of Actual Control (LOC/LAC) and, therefore, the kind of future war in our region may also undergo change. The Indian defence forces have to jointly plan for all contingencies, including conventional war under a nuclear overhang and based on the tasks, individual fighting forces should acquire capabilities. Credible air power has to keep pace with the march of technology and should have the backing of the desired level of self-reliance through own indigenous defence industrial base.

After stating the variables, it would be prudent to mention the factors which have remained constant. The interplay of these variables and non-variables introduces a high level of difficulty in formulating and following an acquisition plan, and allocating resources. These factors are given below.

These factors are being stated to highlight their impact on decision-making and defence preparedness. The Indian armed forces have remained apolitical and under civilian control in a democracy. There is a hot and cold relationship with our neighbours and some of the problems with them have been left over from history, requiring a political solution. The budget allocation for the year is mostly an increment from the previous years, based on the rate of inflation to

provide for very limited increase in real terms. At times, sharp spikes in the defence budget have been made after an event connected with national security. An enabling environment for the all round growth of the defence industry has largely remained on paper, with defence public sector undertakings (PSUs) being the clear favourites. Inadequate efforts in research and development (R&D) have directly related to the technology requirements of the defence forces. At times, lack of self-reliance and the strategic international relations with a few countries have led to acquisitions based on availability and not qualitative requirements (QRs). It is difficult and very expensive to diversify purchases once hooked to defence diplomacy with a country.

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HISTORY OF INDIAN AIR FORCE DEVELOPMENT

The growth of the Indian Air Force has seen ups and downs ever since its inception. Acquisition of aircraft and equipment was initially from the UK and France, and after the Sixties, there was a clear tilt towards the then Soviet Union. The reasons for this shift are well known and the dependence on Soviet equipment grew to such an extent that presently nearly 70 per cent of the aircraft and equipment are from the present Russian state. The IAF had an approved strength of 15 squadrons up to the Sixties and an expansion was ordered after the Sino-Indian War of 1962. The Indo-Pak War of 1965 took place when the IAF was still inducting new aircraft and equipment and it was only in the 1971 War, that the IAF was fully prepared in terms of equipment and training since sufficient time was given to prepare for the war. The Indian Air Force has largely developed its aircraft fleet for border wars, with limited focus on acquiring combat support systems in the past. Even the air defence systems acquired in the past could provide only point defence and they too are on the verge of obsolescence. The deterrence value of these air defence

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systems is not adequate to provide credibility. Barring the Su-30MKI, the aircraft of the Soviet era and other systems are verging on obsolescence. Efforts are on to upgrade the aircraft and equipment to improve their effectiveness for the next decade or so. Fortunately, the emphasis on acquisition by the IAF has undergone some change with the induction of air-to-air refuellers, aerostats, airborne warning and control system (AWACS), unmanned aerial vehicles (UAVS) and other air defence systems, which will permit the IAF to play its assigned role as a major regional player.

DOCTRINE AND FORCE STRUCTURE DEVELOPMENT

Joint military doctrine determines the manner in which the defence forces should be used to achieve national objectives, and the Indian Air Force doctrine should guide the employment of air power. The air force doctrine will guide the future force structure, its organisation, training, equipping and fighting. It helps the air force to plan acquisition of combat systems to support the future missions. Although doctrine can undergo changes, one must remember that building up a capable force will take even longer. Some of the doctrines introduced may have a major effect on the systems to be inducted, and, consequently, on the budgeting. It is important that the enunciated doctrine and policy is converted into force plans and acquisition plans, and appropriate funding is made. One of the doctrines based on the political vision introduced in recent years was "strategic reach" and the other was the emphasis on intelligence, surveillance, reconnaissance (ISR) utilising unmanned vehicles. Greater utilisation of space-based assets and induction of ballistic missiles in the future will bring about a sea-change in the force pattern, with attendant costs, integration with existing assets, etc. It is important that a review of doctrines and policy must lead

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to credible intentions supported by workable plans, acquisition plans, budget allocations and measures of effectiveness.

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DOCTRINE AND TECHNOLOGY

The relationship between doctrine and technology will vary for different forces but its true benefit is what it suggests about the future. Will the air force develop its doctrine based on the likely technology available or will it drive the technological development? If the Indian defence forces are to play their expected role in sync with the country's aspirations, there has to be an enabling environment to develop technologies to meet the laid down doctrine. The doctrinal process should influence the direction of new and developing technologies, especially those connected with military space applications and ballistic missiles.

EMERGENCE OF SPACE FOR MILITARY APPLICATIONS

Civil and military establishments the world over depend heavily on satellites for secure communications, meteorological information, navigation aids, ocean surveillance, integrated early warning, and search and rescue. The Gulf War showed that space can play a crucial role in the efficient execution of wars and it would remain the crucial combat enabler in the 21st century. Although no dedicated military satellite has been launched so far, the Indian Air Force has in the past made use of Indian Space Research Organisation (ISRO) satellites for ISR, communication, meteorology, search and rescue, and imagery. It is understood that a military satellite is likely to be launched soon for utilisation by the armed forces. Increased militarisation of space may lead adversaries to develop systems to knock out these assets. China has already proven its capability in January 2007 and our ongoing research into space-based systems for anti-ballistic missiles (ABM) and anti-satellite (ASAT) is essential for securing our future. The Indian Air Force needs to gear up to use, and protect, space-based assets.

Hypersonic vehicles could be the combat vehicles of tomorrow, which can permit launch of attacks on time sensitive targets from home bases. Recent interest in developing reusable hypersonic vehicles and the increased proliferation of ballistic missiles require air and space to be seamlessly linked for purposes of air defence against trans-atmospheric threats. The need for space-based early warning for effective air defence against ballistic missiles cannot be overemphasised. Only the seamless integration of air and space defence with unity of command, can tackle the trans-atmospheric threats effectively.

RELATIVE STRENGTH OF THE VARIOUS AIR FORCES IN THE REGION

Wars in the last two decades have shown the primacy of air power in winning wars. Both China and Pakistan have embarked on joint development and acquisitions to beef up their air forces with current generation aircraft and systems. Although the total strength of the Chinese Air Force aircraft may be depleting due to phase-out of older aircraft, the total effectiveness has gone up with the induction of the J-10, Su-27, J-11, Su-30MKK and JF-17. Considering the acquisition of more advanced aircraft from Russia and their own development programmes, the People's Liberation Army Air Force (PLAAF) [not counting the PLA-Navy (PLAN) aircraft] should be able to field over 1,000 aircraft of fourth generation and better by 2025 against India. If we calculate even one sortie per aircraft per day, the throwweight against our targets can be overwhelming. In addition, China has, and will continue to deploy an array of ballistic missiles, cruise missiles and anti-radiation missiles (ARMs) to inflict substantial damage.

The Pakistan Air Force (PAF) has 22 squadrons of fighter aircraft with only F-16 aircraft of medium capability and the rest are F-7 versions, A-5, Mirage III and V. Their build-up is expected to maintain the present strength through continued induction of additional F-16s, upgrade of the existing F-16, JF-17 and possibly J-10 aircraft, thus, increasing the number of fourth generation aircraft. The PAF has also ordered six airborne early warning (AEW) aircraft from Sweden and two Il-78 aerial refeuelling tankers. In case the PAF is able to

deploy about 250 aircraft with utilisation rate of two sorties per day using precision guided munitions (PGMs) and beyond visual range (BVR), then the IAF may face limitations in numbers because of deployment in both the west and north.

The problem is that we are unable to link China's capabilities with its intentions. The dragon is rising peacefully but will not hesitate to show its fangs when the time comes.

NATURE OF CONFLICT EXPECTED IN FUTURE

Observe calmly; secure our position; cope with affairs calmly; hide our capacities and bide our time; be good at maintaining a low profile; and never claim leadership.

– Deng Xiaoping

International relations have undergone a sea-change thanks to globalisation but it does not mean that wars will not take place. It is only the nature of wars which will change but as long as there is a state which is weaker than the other, the issue of dominance will come up, and in case the nations are equal in stature, then the competition to corner resources between them may lead to conflict. The possibility of a World War III on the same scale as the earlier two World Wars is remote but the reasons for conflict will continue to exist. Economic interdependence, competition for natural resources, globalisation, food, water, energy security and the role of non-state actors will determine the kind of conflict in the future. The proliferation of weapons of mass destruction (WMD), and more and more countries acquiring strategic strike surface-to-surface missiles, and weaker nations preparing for asymmetric warfare will require different *inter-se* priority amongst a number of procurement decisions. If there is a likelihood of sub-conventional war or irregular warfare, then there will be a trade-off between aircraft purchase and ISR related equipment and platforms. Our region is expected to face more civil wars and insurgencies because of the existing asymmetry between various players. China has embarked on the path to become a great power and is building up its military might to become a superpower in the years to come. The problem

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is that we are unable to link China's capabilities with its intentions. The dragon is rising peacefully but will not hesitate to show its fangs when the time comes. Our boundary dispute does not have an immediate solution and China may attempt to bargain from a position of strength. The two large countries in Asia, with growing economies and a huge appetite for natural resources, energy, water, food, etc may have to compete in the world market but the probability of war is low.

Pakistan and Bangladesh are facing the pangs of developing democracy with rampant poverty and economic slowdown. Without an economic upturn, there can never be peace in South Asia and the regional initiatives will remain just on paper. The spread of terrorist activity based on religious fundamentalism will keep the region on the boil. India will be faced with irregular warfare and the air force will have to be prepared to fight this kind of war under a nuclear overhang. Both China and Pakistan are nuclear powers and are focussed on developing their strategic strike capability and as long as India does not possess capability to thwart ballistic missiles attack, this will be their principal weapon of choice.

LIKELY TASKS OF THE INDIAN AIR FORCE

The wars fought in the last two decades in the Middle East and East Europe did not see air power being used by both sides. War/conflict in our region will have to be fought differently since the opponents are expected to have a credible air force. The terrain is so typical in the west and north that air power, including ballistic missiles, will be the preferred option. In our region, there will be a tussle for command of the air, hence, air defence, both offensive and defensive, will be of primary importance. In case the conflict is limited to irregular or low intensity, then the task of the air force will be mostly supportive of the other Services and will depend upon the area of operations. There is little likelihood of a war against China in the next two decades but that cannot be said about Pakistan. Considering the situation

in Pakistan and its economic conditions, it can only resort to low intensity conflict (LIC) or support terrorism in India. In LIC, the ground forces will be the primary instrument and air power can increase their effectiveness. The tasks will normally be to provide mobility, aerial surveillance and agility to focus greater firepower in time and space, keeping the collateral damage to the minimum.

Another important task for the IAF is directly related to India's role as a regional power and a budding superpower. The IAF may be called upon to protect Indian nationals and other national interests, which may involve disaster relief, rescue of stranded Indians, support to neighbouring countries whenever asked for like in Maldives and the Indian peace-keeping force (IPKF) in Sri Lanka.

The economic growth in India means greater trade and especially the increase in energy consumption implies larger import of oil and gas. The increased investments abroad, especially into natural resources, and their protection, may require our defence forces to be geared up for the expeditionary role. Taking into account India's growing economic strength and transformation of its international stature, it is essential that the IAF acquires appropriate capabilities. A number of scenarios, from full-fledged war on two fronts to limited conflict in a small region can be painted and even use of expeditionary force can be visualised in the next quarter century with a degree of probability attached to each one of them. Operations under the UN flag with forces of other countries are also a distinct possibility in the coming decades. These operations are expected to be tri-Service, with the air force providing airlift capability, logistics support and, perhaps, protection from the air.

WHAT CONSTITUTES A CREDIBLE AIR FORCE?

Simplistically, it should have fighters, transport and helicopters but for this force to be credible, it should have a suitable mix of multi-roles, weight categories and technologies/generations. Transport aircraft are also required in a suitable mix of different weight categories for intra/inter-theatre operations

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and to provide strategic reach. Adequate numbers of aircraft for special tasks and special forces like AWACS, tankers, joint surveillance target attack radar system (JSTARS), joint tactical information distribution system (JTIDS), combat search and rescue (CSAR), gunship, paradrop, electronic warfare (EW) aircraft, etc provide the force multiplier effect. Helicopters are part of the special task force, especially for destruction of enemy air defence (DEAD), combat assault, CSAR, paradrop, air maintenance in hostile/ mountainous terrain, etc. A mix of utility, medium lift, heavy lift, armed helicopter, combat helicopter, etc. is essential, especially with high altitude capability in our scenario, for credibility.

The air defence environment has to be shaped in order to ensure command of the air. AWACS, AEW, aerostats, chain of networked radars, SAMs, UAVs and space-based early warning systems are the major constituents of a credible air defence force, both offensive and defensive. These airborne air defence systems and other high value force multipliers need to be defended constantly by dedicated air defence fighters but this price is minimal once air dominance is gained.

SUGGESTED SIZE AND SHAPE OF INDIAN AIR FORCE

Having discussed the likely tasks and what makes a credible air force, we now need to suggest the future size and shape of the Indian Air Force. I do not wish to suggest the numbers because it has too many pitfalls and even the very advanced air forces have not been able to defend their original acquisition plan for aircraft and systems. Even the debate on manned versus unmanned has been raging with no clear-cut decision on the time-frame and numbers.

The most important factor is credible deterrence and that can be projected through numbers, technological level and combat support systems. When talking about numbers, it is essential that the ratio of aircraft holding between us and the two likely adversaries is maintained, especially in our context with responsibility to defend two borders. The technological level, throwweight

capability and force multipliers will, of course, enhance the effectiveness of the IAF several fold. The size of the IAF has reduced to about 32 squadrons and is likely to go down further from the authorised strength of 39.5 squadrons. The present fleet is a mix of the obsolete aircraft like the MiG-21 variants, with upgraded Bison, Jaguar, MiG-27, MiG-29, Mirage 2000 and Su-30 MKI. Jaguar, MiG-27, MiG-29 and Mirage 2000 aircraft are in the process of being upgraded with improved avionics and systems in order to improve their effectiveness. Integration of PGMs and BVR on these aircraft will increase the kill potential through better accuracy and standoff ranges. These aircraft, along with the Su-30 MKI, can provide the strategic reach in conjunction with Il-78 aerial refuellers and the soon to be inducted AWACS aircraft. The planned induction of 230 Su-30 MKI, 126 medium multi-role combat aircraft (MMRCA) and some light combat aircraft (LCA) will at best arrest the decline in numbers but will substantially improve the combat potential by the end of next decade.

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What should be the number of squadrons and what should be the mix between different technology levels and different weight categories of aircraft? Broadly, the IAF aircraft holding can be divided into three categories viz, low, medium and heavy, and, similarly, the level of technologies can be sub-divided into three levels, namely, low, medium and high. The size and shape of the IAF aircraft inventory has to be a combination of these two factors. The IAF is fortunately heading in that direction except that the aircraft belong to various vintage, types and original equipment manufacturers (OEMs). Ideally, there should be three categories and they should preferably be from the same design house and manufacturer. What I imply is that there is a challenge for the Indian defence aviation R&D and manufacturers to come up with a family of aircraft. We must have a mix of three weight categories of aircraft, with a judicious mix of the levels of technologies. What I suggest is a larger proportion of aircraft in the medium

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weight category, with medium technology through frequent upgrades. This statement is true for transport and helicopters as well and is the only way which can lead to self-reliance and sufficiency. The R&D and manufacture of transport and helicopters has a lot of commonality between civil and military, hence, these programmes will derive huge benefits from synergy.

Determination of number of aircraft, technology level and other force multipliers for a credible air force in different scenarios is a very complex process. It is suggested that the force level be treated as a system and the force mix be arrived at through a process. The interplay of various weightages, relative strengths, technologies, contribution to war-fighting and effectiveness in joint operations in different geo-political situations needs to be systematically studied for purposes of acceptance through consensus. Since there is reduced chance of a full-fledged war in the near future, it will be appropriate to determine priorities, allocate resources and commence programmes to develop technologies and systems now with a fruition deadline of a decade and no more. Participation and guidance as the owner at all levels will be the key. Moreover, the IAF has to maintain the asymmetry in both numbers and technological capability and must apply appropriate fighting strategy during operations. Besides aircraft development, there is a dire need to focus on infrastructure, force multipliers and key technology development in a time-bound manner.

India, being a nuclear power with the doctrine of 'no first use', has to ensure a very credible second strike capability. Presently, the triad is incomplete and there is a heavy dependence on the medium and heavy aircraft of medium or high technology as a delivery platform. The aircraft need to be maintained and made available for the task by the IAF. Survivability of the aircraft and weapons has to be ensured through dispersion, adequate number of trained

crew, fail safe communication systems, clearly defined hierarchy for command and control and, finally, a display of strong will.

INFRASTRUCTURE DEVELOPMENT

The IAF fleet has undergone changes and so have the fighting techniques. Acquisition of short range and mainly air defence aircraft in the Sixties required forward bases near the border to be effective. These bases required standing combat and patrol (CAP) and surface-to-air missiles (SAMs) for their defence and, in fact, faced the brunt during the 1965 and 1971 Wars. With the present aircraft fleet and that foreseen, it would be prudent to base them in the interior so that area defence is effective and more so the aircraft can be used for action in the west, north and over the sea without much wastage of flying hours. An exclusive base for strategic and special forces aircraft may be established in central India. The IAF needs to focus on upgrading our airfields for all weather operations and must automate its logistics management. The additional cost vis-à-vis the effort required to protect the forward bases during war may be determined through modelling and simulation.

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WAR IN CYBER SPACE

In the recent past, a number of computer networks worldwide have reported intrusions that appeared to have originated within the People's Republic of China. It is claimed that the techniques used for intrusion were identical, thus, pointing to a single source. The intruders are not reported to have caused damage to the data or the network but it is clear that the intruders can easily cause serious damage if they are able to intrude. We are embarking on a networking of our systems and, hence, will become vulnerable in case adequate care is not taken to protect our networks. Purchase of hardware and development of software by external agencies is fraught with danger

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and, hence, in-house development of some critical modules with adequate safety measures should be resorted to. The futuristic concept of "no contact war" demands foolproof security of our networks and capability to disrupt that of the adversary. Capability to conduct cyber warfare would make us capable of protecting our own assets as well.

AIR POWER AND FORCE MULTIPLIERS

Budgetary allocation is never enough for the military planners. The proverbial saying "to get the bigger bang out of the buck" is primarily related to acquisition of force multipliers or combat support force to get greater effectiveness. Even timely upgrades bring about a multiplier effect which is generally stated in terms of increase in combat effectiveness. Some of the crucial force multipliers are:

Airborne warning and control aircraft.

Aerial refuelling aircraft.

Electronic warfare systems, including electronic intelligence (ELINT) and commercial intelligence (COMINT) equipment.

Precision weapons like stand-off guided weapons, BVR and directed energy weapons.

Stealth.

Network-centric environment.

Unmanned aerial vehicles/unmanned combat aerial vehicles (UAVs/UCAVs) with sensors for intelligence gathering and targeting cyber warfare.

Aircraft and systems upgrade is a force multiplier.

The IAF has laid adequate emphasis on acquiring some of the force multipliers and the results are already visible but the numbers are totally inadequate to meet the commitments. Three AWACS, two aerostats and six tanker aircraft are not enough; similarly, unless we are able to develop our

own PGMs, we will be dependent on imports and short of teeth. It is well known that we have lagged behind in developing airborne precision weapons but we must understand that the cost of acquisition escalates exponentially when weapons and systems are included as part of the package for fighter aircraft acquisition. Purchase of weapons for initial capability should not push their development programme onto the back-burner. Networking of sensors through a very secure medium providing situational awareness to the command and control (C2) centres and all the way up to the National Command post will definitely change the way the next war will be fought. The ability to conduct cyber warfare will ensure safety of our own networks and ability to cause disruption or disinformation in the adversary networks.

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INDIGENOUS DEVELOPMENT OF TECHNOLOGY

If the Indian defence forces are to play their expected role in sync with the country's aspirations, there has to be an enabling environment to develop technologies to meet the laid down doctrine. A missionary approach is required to develop the required technologies as is being done in the case of space by ISRO. The defence forces must be the stakeholders in terms of both funding and manning. Mere lip-service to self-reliance will not do, and active participation in actual technology development is needed. Greater integration of the scientific community and the user is essential. The Indian Air Force should influence the direction of new and developing technologies, especially those connected with military space applications, aero-engines, UCAVs, stealth, radar, electronic warfare systems, PGMs, and ABM/ASAT.

Taking up the development of a family of aircraft first, I feel that both the Defence Research and Development Organisation (DRDO) and Hindustan Aeronautics Limited (HAL) along with other academic institutions should work on the improved versions of the LCA and commence design and development

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of medium and heavy versions. One may say that it is in conflict with our induction of the MMRCA and Su-30 MKI but I feel that this indigenous effort will help in future upgrades of these bought out aircraft in the subsequent decades and will make them part of the family. Another question arises concerning the future of fifth generation aircraft development along with Russia; I feel that the proposed indigenous technology development will bring to the table a greater amount of our own technology, thus, strengthening our position.

The astounding rate at which the technology is being developed means that the rate of obsolescence will also be very high. Since the operational life of the fleet is likely to be 30 to 40 years, only frequent upgrades would be able to keep the fleet current. Since induction itself takes as much as a decade at the minimum, upgrades and even generational changes need to be planned even during the induction phase. The lessons learnt during the exploitation of the new aircraft point to the deficiencies and the fixes required.

The next focus of our technological development has to do with the debate on manned versus unmanned aircraft systems. UAVs and especially UCAVs have established a niche place wherein the manned aircraft cannot compete. The unmanned vehicles score over the manned with their much greater persistence and capability in attacking time sensitive targets. It is entirely possible in future to have a pilot controller on the ground or in the rear seat of a controlling mother aircraft to direct and guide a number of UCAVs and accomplish the mission. A combination of AWACS, aerostats and UAVs is formidable for ELINT and electronic support measures (ESM) purposes. Satellite imagery and that received from UAVs in real-time can provide the intelligence required for turning the tide against the adversary. Efforts to integrate UAV operations with other civil traffic will pay huge dividends and aerial refuelling will give it trans-continental reach. Development of sensors, data links and information technology (IT) will provide net-centricity, thus, changing the way the next war will be fought.

There are just about five or six countries in the world that have the technology to develop jet aero-engines. The history of aircraft development in India is well known and one of the major reasons for failures or short closing of programmes is the lack of a suitable engine. The DRDO has been working on this niche technology for over three decades but has not developed an engine which has got airborne so far. India must join this select group and the DRDO should take all steps to develop a jet engine and lay the foundation for developing scramjet engines in the future.

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The manned flight is expected to take a leap through the hypersonic plane. The limitation of human endurance is sought to be overcome through speed. R&D into this development will place India in the big league but I feel that it is the engine development which is likely to affect the development. The Kaveri development has not been successful so far and developing a scramjet will be a tall order.

BALLISTIC MISSILE DEFENCE (BMD)

The potential adversaries are developing their nuclear arsenal and delivery systems using ballistic missiles. The IAF will have to develop a potent air defence system against this threat. Some effort to develop the ABM system against these ballistic missiles is going on but unless space-based systems for early warning are in place, the success will be limited. There is a need to develop and network a combination of early warning satellites, ground-based radars and suitable surface-based or, if required, space-launched weapons.

MANNING REQUIREMENTS OF THE FUTURE

The IAF has already undertaken transformation in the manning, especially with respect to training and is considering the improvements in the teeth to tail ratio. The manning will depend on the number of squadrons, combat support systems and other infrastructure support but I feel that the IAF

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needs to be active in developing systems and technologies in-house for direct application in the field. These systems could also be developed through outsourcing but the decision to do so will depend on the level of technology and investment. There may be a need to induct suitable technical officers in a different cadre who can be either deputed or tasked with application technology development in-house. There is also a need to look at inducting civilian officers for tasks which require continuity like training, administration, etc.

ORGANISATIONAL STRUCTURE

The present organisational structure is suitable for the kind of border war expected in the future till the time when either the borders become irrelevant or the problem is resolved amicably. The IAF may consider change from geographical commands to functional commands in case the basing policy, as suggested earlier, is implemented and the likelihood of border wars has receded. There is an urgent need to form an Aerospace Command and Air Defence Command with the induction of space-based systems and increased responsibility for air defence against ballistic missile threats and cruise missiles.

AFFORDABILITY

Defence budget allocation reached a low of less than 2 percent of the gross domestic product (GDP) in 2007-08. This is definitely not enough and a correction is essential. The suggestions made in the paper are long-term directions and mainly concern developing indigenous technologies. During this period of economic slowdown, investment into design and development of technology will draw huge benefits later on. This is the time to set upon a path to become an exporter of high technology and arms rather than depend on import which

indirectly supports the foreign defence industry. The ownership of technological innovations, whether through DRDO, PSUs, public-private partnership should be with the defence forces and the return on investment should be directly linked with the amount invested by the individual organisations. What is important is not the amount expended but the accountability of each one of us to get the most out of the buck. Some small steps have been taken in the past towards expenditure control through base level data gathering and bringing in transparency but the scope needs to be expanded through improved connectivity and computerisation.

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CONCLUSION

Countries in the South Asian region are undergoing major changes in their polity and India is definitely affected by it. We may not see a conventional war in our region but sub-conventional or LIC cannot be ruled out. It is essential that we calculate the requirement of a combat force, including the support elements, rather than merely the number of aircraft. But the one thing that is certain is that the IAF has to maintain the asymmetry in both numbers and technological capability and must apply the appropriate fighting strategy during operations. Major acquisitions are in the pipeline and, hence, the IAF inventory will look very different in the future. More emphasis is being laid on acquisition of combat support systems as force multipliers but we must develop the technology which we need to fight the next war and not have to fight it with whatever is made available to us. The IAF needs to guide development of technology as a stakeholder, and interoperability with the other Services has to be built in. The IAF can make do with small aircraft with limited capability for border wars but has

to have larger swing role aircraft, with greater reach and varied payload for meeting the regional and global commitments in the future. Development of space-based assets and capability to thwart ballistics missile attacks will be essential in the future, considering the direction taken by our potential adversaries.