AEROSPACE POWER AND INTEGRATED OPERATIONS

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INTRODUCTION

At the outset, it is appropriate to gratefully acknowledge the profound influence that air power has had in our living times – and, indeed, in shaping the destiny of military conflicts. The term "living times" is being used to allude to the relative short time-span (103 years), during which air power has made such significant and rapid strides to become a predominant instrument of military power.

It is good to be reminded that aviation continues to produce frequent surprising events. After all, humankind required only 66 years to go from flying the first heavier-than-air-aircraft to landing on the moon! In fact, the major changes and developments – popularly termed as "transformation" – have taken place only during the last two decades and yet, like the prophets, we hope that the current and future generations joining the air force can look forward to the fulfillment of air power's promise in the years ahead. But then, what were the real qualities of the earlier prophets who accurately forecast air power's potential? They based their ideas on reasoning and intuition rather than any scientific formulations as to how air power might achieve decisive results. And in the end, they were proven right. At least the current generations are benefited with the advantage of hindsight and historical wisdom as these issues are debated.

It is also unique to note that the last two decades have witnessed a major adaptation of how air power has been applied successfully, ranging from Operation Desert Storm, in Bosnia, Kosovo, Iraq, Afghanistan, Kargil and very

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recently by the Israeli Air Force in Lebanon. What is revealing is that in these operations, air power played a crucial role and proved to be the lynchpin of military operations. Therefore, in this "Century of Air Power," its potential as also its restraining influence have been fully realised.

But first, a note of caution: in this interesting debate, no two nations face similar security challenges nor are the military and security forces structured along similar lines. Considering air power's unique characteristics of agility, speed, reach and lethality, it would be a fair assessment to state that most air forces exist to conduct military operations on behalf of their nation, and if necessary, to go to war. It is important to understand that this is the unique role which separates us from the other professions of arms since the consequences of a victory or defeat are indeed profound – both to the nation and to the Service. It is, therefore, necessary to appreciate the type of conflict we are engaged in, the factors which influence air power's unique application as also its limitations; the exploitation of unique technologies; the "effects-based strategy" and how operations are integrated. All these need to be fused into a composite 'decision' cycle for assuring the nation that we, indeed, possess a credible offence / defence capability. Within the broad framework of national objectives and resources, most militaries today are structuring their forces, doctrines, training and command and control functions with the objective of implementing integrated operations and concepts.

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The complex and multi-disciplinary nature of modern warfare has placed increasing demands on the concept of "Joint Ops." As a result, the term "Joint Ops" in the 21st century is being considered as far too restrictive in its construct. It is also surprising to note that "jointness" as a concept and "jointmanship" as its product are viewed differently by different people. A little research will indicate that both these words are not even mentioned in the *Oxford English*

Dictionary! Maybe this is the reason why we spend a lifetime trying to comprehend how we can fight and win wars together.

At the same time, there is no denying the fact that if conflict situations are of permanent nature and require a multi-disciplinary approach, then you cannot do it all by yourself. It is not only the military but diplomatic, informational, political and economic factors and a host of other agencies – all play a part in some form or the other. In the context of the Indian Air Force (IAF), we can visualise all air power activity which needs to be integrated with all other levers of power. These could be with the other Services, i.e. army, navy and other government departments and agencies, the Ministry of Defence (MOD) and other civilian and industrial organisations. This concept of "Integrated Ops" highlights the importance of effective integration and cooperation between the IAF and all the non-IAF organisations. These could be at the joint-level, multi-agency or even at the multi-national level. It is here that the term "interoperability" – which is bandied about quite carelessly these days – takes on a new dimension when we expect our trained ground / air crews and planning staff to convince the other partners in the integration of air power in joint military and civil-military operations. The integrated operations conducted by the IAF with other agencies in the wake of the tsunami disaster is one such example.

The central theme of this paper is to examine the role and influence of aerospace power in Integrated Ops, essentially in the Indian context. The cause and nature of conflict will be examined, followed by the technological imperatives needed for effects-based operations and the transformation strategies in the revolution in military affairs (RMA). While the US has assumed the leadership role in current developments, these have had a profound impact on the manner in which aerospace power contributes to Integrated Ops. An attempt will also be made to highlight the associated challenges which encompass joint planning, including doctrinal, organisational, informational and technological issues.

CAUSE AND NATURE OF CONFLICTS

In the 21st century, the cause and nature of conflicts are expected to assume a more divisive character. It is quite evident that the world today is highly

interconnected and that any conflict has the potential to influence events far and wide. At the strategic level, the two areas of friction which may lead to regional instability and growing confrontation comprise the depletion of vital natural resources, i.e. fresh water and carbon-based fossil fuels. While the economies of the developed world continue to depend heavily on the uninterrupted supply of oil, the growing energy demands of the developing countries led by China and India (3.8 per cent annually), has added new competitors. Overall, the world's projected energy consumption from fossil fuels will increase by 63 per cent till 2020. As per the US Department of Energy in a 2005 analysis, it is claimed that peak oil (the point at which global oil production will reach its zenith and then begin to plummet) could be reached as early as 2016. Therefore, in addition to exploring alternative strategies for securing energy, a premium will also be placed on additional vulnerabilities in the storage, processing and oil supply chain. It follows, therefore, that the engines of industrialised military complexes which rely so heavily on power, nuclear energy and oil sources, would constitute high value target systems.

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For a moment, take a look at the nature of conflict, which itself has undergone a major change. The days of total wars, including extensive mobilisations, etc, appear to be a thing of the past. The nuclear factor has emerged as the key factor – at least in our part of the world – and increased economic interdependence, world opinion, media activism, etc, have overall resulted in the transmutation of armed conflicts. In order to prevent the cascading effect of instability spilling over into the other regions of the world, we are most likely to witness wars which are limited in scope, time and space but prosecuted at high technological and yet higher intensity levels. It is here that aerospace power has the distinct advantage of speed and firepower which can be brought to bear in order to achieve a favourable end-state.

In a limited war scenario, determining the objectives and this end-state also

poses a dilemma. In the short time span available, are we looking for an outright victory or a favourable outcome or are we content in preserving the status quo? Perceptions too matter. For example, a military stand-off in a limited war between a bigger and a small sized military force is likely to create the perception of the smaller force having won. Take the recent case of the Israeli-Hezbollah conflict in Lebanon. We have been informed of the outstanding performance of the Israeli Air Force in this short conflict. However, the perception, at least in the Middle East, is that the Hezbollah did not lose the war. And in this context, not losing against the most powerful military in the region amounts to winning the war! Thus, it is important to define the type of dominance required in such types of limited conflicts.

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At the other end of the scale, 9/11 demonstrated perhaps more vividly than any other single event, the extent to which the world has changed in recent years. Gone are the days when wars took months to launch and years to prosecute. Today, our enemies operate not at the speed of armies and navies moving across a battle-space, but at the speed of information moving across cyberspace, cellphones and satellites. While terrorism *per se* is not new – in fact, we in India, have been dealing with this insidious phenomenon for at least the last 20 years – the nature of the threat has changed dramatically and it has now assumed a global dimension. If we were to include the proliferation of weapons of mass destruction and the ability of states and non-state actors to covertly support these groups, then we collectively face a very serious threat indeed. And the real danger is in the perceived asymmetry which has been created by this new phenomenon. To this old problem has been added a new twist: the growing probability of attacks by "super-empowered individuals," (e.g. terrorists armed with nuclear, radiological and biological weapons of mass destruction), who are not vulnerable to conventional modes of retaliation and effective deterrence. In asymmetric and state versus non-state conflicts, the focus is on surprise, maneouvre and psychological attrition and demands a different collection of tools for success.

While the future always appears uncertain, overall our more capable militaries must contribute to preserving security and stability in a fractured environment which is characterised by diverse and non-conventional challenges. It is for this reason that we have chosen to gradually move away and reorientate our defence strategy which basically addressed short-term dangers based on "threats" towards a capabilities-based planning to meet the long-term threats. In this process, the uncertainty factor is taken out of the equation and the forces are structured to meet both short and long-term contingencies. This issue will be subsequently examined in greater detail.

REVOLUTION IN MILITARY AFFAIRS AND TRANSFORMATION

Earlier, a mention was made of the profound changes which have taken place during the last 20 years in the development and application of air power. These changes came about as a direct result of the integration of new operational concepts and doctrine with technology, including a new strategy which advocated an "effects-based approach." But before the validity of this new approach is examined, it would be relevant to note the background which necessitated this change. It may be recalled that historically, most independent air forces grew out of the need to support land and sea operations. Thus, a measure of an air force's effectiveness – a la 'jointness' – was gauged from the number of sorties per day which could be apportioned to support ground operations instead of the direct effect that air power could deliver on the battlefield.

The principles of "mass and destructive power" which were truly reflective of the "attrition and annihilation" type of warfare being conducted by the ground forces also became the rallying point for air power theorists. How else does one explain the rationale for the 1,000 aircraft mass bombing raids over Germany in World War II? This type of linear or sequential warfare, where destruction of the enemy's armed forces became the prime strategic objective, formed the basis of this strategy since it involved a gradual progression towards the enemy's centre of gravity in a sequential nature. As a result, in the earlier air campaigns, air power was applied sequentially to first neutralise the enemy air defences i.e. radars, surface-to-air missiles (SAM) sites, airfields, etc before attacking targets of highest

value. At the same time, the battle for achieving "air superiority" or for creating a favourable air situation came to be viewed by the ground forces as a private campaign of the air force and its reluctance to support the ground forces in the joint battle.

In our assessment, this model is still very much a part of the operational plans of a number of armed forces which perhaps do not have access to high-end technology. There are three other possible reasons for this as well – the first is that the levels of technology before the 1990s did not provide precision in weapons delivery and, therefore, the relevance of mass raids. Secondly, as the potency of enemy air defences increased, so did the number of resources to suppress these. And, lastly, there was the lack of an operational level concept for conducting effects-based warfare. Overall, therefore, technology has become the key **enabler** which has altered the dynamics of linearity, thereby providing us with a different or a non-linear approach; or as the United States Air Force (USAF) terms it, as "parallel war".

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Recent air operations bear testimony to the fact that once the focus shifted from force-on-force to an "effects-based strategy" then it was possible to achieve similar or better results with fewer resources. More importantly, the nature of parallel war exploited the three dimensions of time, space and levels of war to achieve the aim of rapid dominance. The constraints of geographical space no longer remain a limitation and the various levels of war i.e. strategic, operational and tactical are merged into one seamless entity since all the types and levels of targets can be struck simultaneously. During Desert Storm for example, over 50 targets were on the master attack plan within the first 90 minutes and 150 separate targets were designated for attack during the first 24 hours. As Jeffery Mekitrick observed, "**By the year 2020, it is not out of the realm of possibility that as many as 500 strategically important targets would**

be struck in the first minute of the campaign – representing a 5000-fold increase over Desert Storm capabilities."

But none of this would have been made possible without developments in precision – in both navigation and weapon accuracy. The current precision munitions offer exceptional accuracy and their fusion with other sensors and satellite information has resulted in much higher assurance levels, thereby, drastically reducing over the target requirement (OTR).

It was the Israeli Air Force which first laid the foundation of this new "revolution" in military affairs or RMA during the Bekaa Valley campaign (which lasted only four days) in the early 1980s. This was followed by the US led Allies in the Gulf War in 1990 and in Op Enduring Freedom in the Afghanistan campaign. By basically using lesser resources and compressing what is often called the "kill chain" i.e. detect, decide, attack and access, this revolutionary change further enhanced the impact of air power during integrated operations. This radical change was best exemplified during Op Desert Storm in 1990, when over 80 per cent of the bombs dropped were on pre-determined targets. A comparison just 15 years later with Op Enduring Freedom reveals that over 80 per cent of the targetting information was provided to attack aircraft in the air – a perfect example of the speed of technology and networking information from sensors on the ground to the shooters in flight. Above all, this new concept maximised the application of air power on an effects-based approach, where no target – howsoever difficult to attack – could stay out of reach of the power dominating the battlespace. More importantly, this new strategy shifted the focus from the "means" to the ends or the "effects" which now received the highest priority.

Considering its overall promise, RMA in recent years has given way to "transformation" as the guiding rationale for most developments in the leading air forces. But then, what exactly does "transformation" mean? A quick reference to the *Oxford Dictionary* states that to transform is to make considerable change in the form, character or disposition. Please note: the emphasis is on the word "considerable," which in our context is the major change that is being sought. Here one is reminded of Prime Minister Manmohan Singh's recent statement in Parliament while debating the Indo-US nuclear deal when he said that, **"....in**

this 21st century we are assured of only one constant factor and that is change." Well, in this air power debate, it is technology which constitutes the nucleus and which continues to produce the dramatic changes. It is also relevant to note that while technology has been exploited in respect of improved airborne sensors, precision weapons, platforms (manned and unmanned), space-based assets and higher computation capability, the major change has also been ushered in by fielding centrally controlled network systems.

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NETWORK-CENTRIC OPERATIONS

Potential

The goal of network-centric operations (NCO) is to enable forces to accomplish their objectives more efficiently with greater situational awareness all round; with lesser forces and with fewer weapons. It is really the answer to relay accurate and timely intelligence for speedy decision-making by the commanders in the field. Put simply – you remain two steps ahead in the game.

Operational Challenges

Notwithstanding the reach of technology and the success achieved in what may be termed as a one-sided war in Afghanistan and Iraq, NCO has also revealed certain shortcomings. Perhaps the biggest challenge of network-centric warfare is that while senior commanders get flooded with information which may lead to micromanaging operations, the junior commanders either get very little information or receive it late or not at all. The other factors which compound the problem are glitches in technology gaps or inadequate training.

Technological Challenges

Two technological limitations also need to be noted. Firstly, bandwidth is the information lifeblood of any network and NCO rapidly eats up signal

bandwidth. As demands for information continue to grow, NCO will constantly require more and more bandwidth. This implies that there would be a premium on managing bandwidth more efficiently and for installing command and control systems that are better able to prioritise and sequence the flow of data. Secondly, sensors which are the starting point of any network, will always be susceptible to jamming. And as technological options increase, the network themselves may be attacked. Lastly, while NCO speeds up the entire kill cycle, its greatest weakness is its inability to distinguish between friend and foe. The answer, therefore, is to create networks which are tough, flexible and with adequate redundancy.

Technology as the key force multiplier is already providing solutions to some of these problems. Take the case of the high data transfer rates and advances in data compression algorithms; these offer tremendous improvements. The demands will also reduce when we fuse the various sensor data. In any case, optical wavelengths offer almost unlimited bandwidth and when we can use a laser or a fibre optic link, the bandwidth problem is virtually non-existent. In future, networks will present options that will enable us to shape the strategic environment well before the opening shot is fired, thereby implying that doctrinal changes will struggle to keep pace with the fast unfolding events.

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ANALYSIS

An analysis of all that has been stated so far indicates that aerospace power has gradually evolved with the maturing of technologies to meet the requirements of speed, accuracy, lethality and ability to strike targets with precision over long ranges and across large geographical areas. By these attributes it has become the prime instrument for preemption, coercion and deterrence strategies. Besides enhancing the capabilities of land and naval forces, aerospace power also has an

independent capability to dominate hostile military power across a broad spectrum of threats and scenarios. Viewed in the larger context of national defence strategy, the integration of aerospace capability with the land and naval forces has resulted in maximising the effects of military power – so vital for the 21st century battlefield.

INTEGRATED OPS IN 21ST CENTURY

Type of Integration

As history has amply demonstrated, while land, sea and aerospace forces have their unique strengths, neither can guarantee the country's security alone. At the national level, there is a requirement to harness all elements of national power by integrating and coordinating the efforts of the Services, MOD and other security agencies with the work of others. The challenge of integrated operations is to build trust, synergy and momentum in realising national security objectives, but the devil is in the details, and efforts to complement and strengthen other elements of national power depend on leadership, inter-agency relationships and reliable avenues for communication. It is for this reason that wars in the last two decades have witnessed an increased emphasis on "Joint Ops."

The Indian Experience

The historical record in the Indian context has produced somewhat mixed results: the IAF effort to airlift the 1 SIKH Infantry battalion into the Kashmir Valley in October 1947 and its continued support in the Leh and Poonch sectors proved to be crucial in preserving the status quo of Jammu and Kashmir (J&K), as it exists today. We also believe that the course of the Sino-Indian War of 1962 would have taken a different turn if the combat potential of the air force had been applied in this short conflict. Following the 1965 Indo-Pak conflict, the credit needs to be given largely to the efforts of our former Chief of the Air Staff (CAS), Air Chief Marshal P.C. Lal, who laid the foundation of sound Joint Ops planning and execution. The result of the restructuring and establishment of mechanisms to facilitate inter-Service cooperation proved their mettle six years later during the Indo-Pak conflict in 1971, following which, Bangladesh was created.

Concept of Jointness

There is no doubt that despite all the asymmetries, future wars will require ground forces and "boots on the ground;" however, aerospace power will continue to have decisive importance for operational success. While our joint structures have stood the test of time, there is a need to recognise that in the uncertain future of tomorrow, the meaning of "jointness" is not the equal or mandatory use of each Service in every conflict situation. Quite often, it is misinterpreted as "allocations to each Sevice" rather than an integration of each Service's capabilities. This leads to a situation similar to a game of hockey, where every player in the team gets to play in all the league matches! This is the wrong kind of jointness which leads to inefficiency and wastage. The objective here is to recognise the unique capabilities of each arm and Service and to integrate the strengths of each Service for producing the desired synergy. So jointness is a means for ensuring success, and not an end by itself.

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Challenges

From this it follows that lack of understanding and respect of the other partners' capabilities, strengths and weaknesses leads to erosion of trust and confidence. Petty issues take centre-stage and are blown out of proportion while the basic lack of confidence feeds on the peripheral issues. The "what's in it for me" syndrome, the desire to hog the limelight and turf battles are all time-tested but perennial problem areas. Our humble experience in this "jointness" game leads us to believe that as long as the commanders at the top agree – and even agree to disagree – and understand the overriding importance of the mission and have confidence in their ability to deliver – the others down the line simply follow suit. Therefore, lack of jointness, if any, in Service organisations can invariably be attributed to leadership issues all round. There are, however, ways and means to overcome some of these problems.

JOINT OPS

Need for Specialisation

In the Indian context, there is a requirement for other agencies and organisations to appreciate the unique and independent role of the specialist organisations. Here a reference is being made to the professional character and war-fighting ethos of the army, navy and air force which, in turn, gets reflected in the capabilities of the commands and field formations. Considering the nature of the threat and the operations envisaged, the three Services would have to bring to the table their unique specialisation and expertise for conducting effective joint operations. And on this subject, an interesting observation needs to be noted. Our experience indicates that of the three specialisations in land, sea and air warfare, the biggest tragedy is that the maximum awareness (or, to use a diplomatic word, "wisdom"), pertains to the land forces or land warfare and the least to air warfare. There is a historical reason for this imbalance, given air power's late entry in this warfare domain. As a result, in joint formulations, there is a tendency to template land warfare theories which are then superimposed over air power applications, leading to misplaced notions of jointmanship and misutilisation of combat assets. The bottom line is: **"You don't have to own an asset to exploit it."** While joint training and doctrine would assist in effective integration, the syndrome of "under command" and Service seniority, etc, would need to be replaced by a coordinating tasking mechanism with clearly defined command and control and functional responsibilities.

Joint Planning

The three Services have indeed made considerable progress in this area and the first step has been the renewed focus on "Planning for Joint Ops". It has even been suggested during earlier discussions that the term "Planning for Joint Operations" needs to be replaced by "Joint Planning for Operations". This is not a case of mere semantics only since the issues are complex

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and Joint Staff needs to be not only involved in the planning process but also accountable as well to see that their plans actually work on the ground. Given the complex nature of integrated operations where a large number of inputs are processed, it is recommended that a centralised mechanism be established for overseeing the planning and coordination aspects for the main, as also for the contingency plans. This factor becomes highly relevant in conventional, unconventional and limited conflict scenarios, especially when it is accompanied with a nuclear overhang situation. It is encouraging to note that the planning process has begun to take shape in the recently formed Integrated Defence Staff (IDS) HQ under the aegis of the Chairman Chiefs of Staff Committee (COSC) and as a first step, a host of contingency planning options have been examined and finalised.

Centralised Planning and Decentralised Execution

The emphasis in this entire process is not only on centralised planning but on decentralised execution as well. These aspects are two sides of the same coin. It needs to be emphasised that the focus has to remain on decentralised execution since it serves to "encourage disciplined initiative" and improves "situational responsiveness." Our entire system of training aims to develop air crew with the ability to take stock of the existing tactical situation and execute their mission. Centralised execution, on the contrary, amounts to micro management and is counter-productive. This is particularly relevant today when modern technology enables a commander to have access to large volumes of information and data. It is strongly recommended that commanders should remain focussed on high-level issues and avoid delving into mundane technical details.

Unity of Command

When we plan to integrate the potential of aerospace power with other components, the aspect of unity of command and indivisibility of air power needs to be preserved at all costs. This will ensure that our assets – and in turn – our capabilities are not parcelled out in small packets but retained as a composite whole with clearly defined chain of command and functional responsibilities. This

aspect assumes added significance in the light of the meagre resources, competing demands and increased expectations of each Service. It is equally important that all these endeavours are guided by a joint doctrine for war.

Joint Doctrine

The last six decades have seen the Indian armed forces being engaged in at least four major conflicts, with an ongoing undeclared war with Pakistani troops in the Siachen Glacier – the highest battlefield in the world. While each Service has its doctrine, the Joint Doctrine for war has been published only as recently as May 2006. We are in agreement that a joint doctrine should be embedded in the heart of warfare since it represents our centralised belief in joint operations. This document should now be the guiding beacon to show the way ahead, with necessary emphasis on joint application of military power in various scenarios in addition to data and communication integration, decision support systems, intelligence collection and dissemination and space-based assets for facilitating joint operations. More importantly, this doctrine should define how the joint plans are evolved around a common objective. In this context, there are two issues which need to be highlighted: joint targetting and joint training.

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Joint Targetting

Earlier the benefits of effects-based operations and exploitation of technologies to execute precision strikes were discussed. Having achieved a very high level of battlefield transparency with satellite imageries, recce and unmanned aerial vehicles (UAV) assets, it is possible now to undertake these missions with precision weapons. In other words, **"Air power is Targetting and Targetting is Intelligence."** This constitutes the core competency for a joint targetting philosophy. In order to derive benefits from this force multiplier effect, there is a requirement to formulate a joint targetting philosophy which would involve detailed planning in order to prioritise the targets list, identify designation and

weapon options and thereafter leave the execution options to the Service which is best optimised for delivering precision strikes i.e. the air force.

Joint Training

It goes without saying that joint and collective training goes a long way towards enforcing our belief in each other's capabilities, and respecting the limitations. The joint training dilemma can be best explained as ... **"The problem is they don't know what they don't know; then don't know how to use it effectively when they do!"** It is only during peace-time that we can resolve issues related to a common communication protocol, fire support and coordination drills, defence suppression and intelligence sharing. It is also the period when the interoperable needs of each Service are identified and converted into employment tools.

INTEGRATED OPS

Joint Level

It may be recalled that earlier the term "Integrated Operations" was advocated in the context of involving the IAF and all other non-IAF organisations. This integration is visualised at the functional or the joint level with the other Services i.e. the army and the navy; and as a result of this initiative, two integrated commands: the Strategic Forces Command (SFC) and the Andaman and Nicobar Command (ANC) have been recently established. The next level is at the multi-agency level involving the Services and other quasi-military and non-military and joint security agencies. Developing aerospace capabilities to support internal security and disaster relief operations would come under this category.

Capabilities for Internal Security and Disaster Relief

We have recognised the need for integrating air power capabilities not only with the other Services, but also with the other organs of the state. Here a reference is being made to the peculiar internal security requirements of the country which *inter-alia* involve the Ministries of Defence, Home, Civil Aviation, etc. There have been a number of occasions where members or units of these agencies operate in conjunction with or under the armed forces, especially when involved in internal

security operations, in disaster relief and under the UN flag. While doing so, it is inevitable that command and control functions and tasking will need to be reassigned based on the agency or Service best capable of executing the task at hand. In the recent past, Joint Planning Staff have apportioned a higher level of roles and missions to the Air Staff, indicating a greater level of awareness and realisation of air power's potential.

Multi-National Integration

Finally, we are seeking an integration at the multi-national level where we identify common grounds of defence cooperation and mutuality of interests with other foreign partners. On this point, it needs to be emphasised that when we examine the changing world order and globalised economy from our strategic perspective in this age of balance of power system which includes the US, Europe, China, Japan, Russia and possibly India, the economic progress of India is not viewed as a threat but as a possible engine of growth in the world economy and polity. The need, therefore, for an inter-disciplinary integration at the multi-national level with shared common areas of security concern is inescapable. The IAF is presently in the midst of an extensive modernisation programme and in due course, we would be better placed to deal with the entire spectrum of threats. Our refueller force has not only been operationalised but is being further expanded, thereby, giving us more options and global reach. We are integrating with the other Services to deal with limited out of area contingencies and are closely examining the exploitation of space-based resources for enhancing technical intelligence.

INTELLIGENCE AND INTEGRATED OPS

The lessons of the Kargil conflict in 1999 have had a reenergising effect on our intelligence apparatus and these have undergone a major transformation. Apart from creating new structures at the national level, including the Defence Intelligence Agency at the Services level, there has been an increased emphasis on TECHINT (technical intelligence) and use of aerospace to enhance command, control, communications, computers, information, intelligence (C4I2) functions.

We are presently in the process of integrating and fusing some of the sensors and imaging data which will assist the three Services in speeding up the decision cycle. At the national level, an attempt is being made to achieve complete self-reliance in design and manufacture of space-borne sensors. India is amongst the few countries that has displayed its capability to launch satellites with high resolution imaging sensors. The successful launch of the Cartosat-1 and Cartosat-2 series of satellites provides us with this unique capability. A greater interaction is also being sought with the Department of Space and the Indian Space Research Organisation (ISRO) in a wide range of activities since the space domain is most useful for tri-Service application.

FORCE STRUCTURES AND DEVELOPMENT PLAN

Inevitably, the question of integration revolves around the type of structures or methodology to be adopted in the Indian context. Basically, three types of approach are suggested. The first is a bottoms up approach involving the Services at the lowest level, with joint training, joint intelligence and joint planning at the operational level. The second is the top down approach which advocates creating force structures and a Defence Capability Plan based on a common joint doctrine. We are perhaps following the third approach where both processes are being applied simultaneously.

Force Levels

There have been suggestions that the induction of force multipliers and modernisation of the armed forces when balanced against shrinking defence budgets and rising costs of defence should lead to reduction in combat force levels. While some cuts and downsizing may become inevitable in respect of units and formations which are bulky and unwieldy, historical experience indicates that force structures should be driven by strategic requirements and the need to acquire a

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given set of capabilities. This aspect becomes crucial in a joint scenario, especially when some capabilities are dual-based, with one Service complementing the role of the other.

Capability-Based Approach

If India, and indeed, its armed forces are given the opportunity to exploit the technologies available – both from within the country and outside – then it is imperative that we adopt a capability-based approach. This is easier said than done as traditionally we are more comfortable dealing with numbers, force levels, force ratios, etc. While these will still be relevant, the focus will have to shift to acquiring critical technologies in increments to achieve a desired capability level. It is recommended that this approach be supported by the three pillars of capability-based planning, management and production. The first stage would identify the environment, the various contingencies, the existing joint doctrine and the capabilities that need to be created. The second stage would address the capability gaps that need to be narrowed from existing force levels and structures, including interoperability of platforms, communication protocols and resources management. The production stage would aim to close the loop by ensuring that indigenous research and development (R&D) and foreign production agencies actually result in the three Services acquiring the given set of capabilities. The Defence Capability Plan needs to be developed on the basis of through-life costing estimates which should cover not only the initial capital investment but also personnel, operating, support and upgrade costs. This entire process would then need to be integrated with the Five-Year Plan periods and resources allocated accordingly.

Technological Experimentation Process

Considerable progress has been made by the IDS HQ which has become a key agency along with the Services, for formulating the Defence Capability Plan and the Long-Term Integrated Procurement Plan for capital acquisitions. While to the outside world we may appear to be making haste slowly in the procurement process, what is needed is an integrated long-term development plan for each

Service, based on the technologies that need to be inducted. While doing so, we need to thoroughly examine existing programmes and projects and take bold decisions to involve an experimentation process. This technological experimentation offers the three Services an opportunity to identify innovative solutions for acquiring future capabilities. We will have to make valued judgements and take some calculated risks, if need be, since there is a big gap between current force capabilities and where we want to reach in the next 15-20 years. Our acquisition programmes need to have the in-built flexibility to include innovation into new programmes and to absorb technological developments rapidly. Past experience also indicates that in large and complex programmes, there are high risks of costs and time overruns leading to technological obsolescence. These can be easily avoided to include incremental technology insertion into these programmes with a promise that aerospace capabilities are delivered with the potential for future growth. This would require a close integration with indigenous R&D organisation, industry, Ministries of Defence and Finance as also transfer of technology and tie-ups with capable foreign players, strictly on a need-based approach. In all these endeavours, the user and the industry have to be closely involved with clear guidelines on responsibility and accountability – at the functional as also at the management level.

CONCLUSION

It is always a risky business to forecast future trends in the application of aerospace power to fulfill the need for integrated operations. But in spite of the uncertain international environment, there are a few fundamental views that stand out glaringly. The first is that military forces will continue to be employed against conventional and non-conventional threats, though the nature of conflicts is expected to remain limited in scope and content. Second, there is nothing new or novel in the idea of air power application to deal with asymmetric threats – after all, we have been doing so for the past 60 years at least; the prospect of precision strikes over long ranges by air and naval forces has altered the dynamics of deterrence at the conventional level. From this it

follows that air power will assume increased importance in the years ahead and constitute the instrument of choice for not only conventional deterrence but also for coercive diplomatic strategies. This aspect has not been lost sight of by some of the neighbouring countries in our region where greater momentum has been imparted towards modernising their air forces.

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Third, technological developments will provide new opportunities to both sides; the key issue is that the side which exploits this unique capability first to achieve a favourable asymmetry will succeed in dominating the battlespace. But technology by itself is not the panacea for all evils; it has to be matched by new processes, new structures – especially if the old ones have outlived their life; new thinking, and more importantly, thinking out of the box. The effects-based approach and transformation in RMA contribute to these new processes and will constitute the bedrock of a number of air forces' future developmental plans.

In the context of aerospace power application in the Indian subcontinent, this integration is visualised with the other levers of power at three different levels. The basic level is at the joint level with the other Services, moving up to the multi-agency level with other government ministries and civil organisations and, finally, integration at the multi-national level in mutual partnerships and cooperative endeavours dictated primarily by national interests and security objectives. While we are engaged in these various processes at different levels, the basic tenets of aerospace power like unity of command, centralised joint planning with decentralised execution and indivisibility of air power assets should not be lost sight of.

We also recognise that each of the armed forces has a specialised role while operating individually or in concert with the others. There would be reassignment of tasks and functional responsibilities based on the capabilities and the operational requirements. In this joint warfare scenario, we expect that aerospace power will

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provide the necessary synergy and momentum provided we have access to vital joint intelligence inputs and have developed the necessary understanding based on years of joint training and a common war-fighting doctrine. While each country will establish structures based on its needs and security challenges, it is suggested that a long-term capability-based approach be adopted. This will ensure that the integration of emerging aerospace technologies with the desired capabilities is achieved optimally in the shortest time possible.

Finally, the major lesson learnt from all previous operations is that our capability is derived from our people, regardless of our reliance on technology. It's all about effective leadership. And as we gratefully acknowledge the leadership role and contribution of the early pioneers, who 75 years ago defined the future role of the IAF, it is hoped that we in some small measure would be able to fulfill that promise not only for this but also for our future generations.