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(April-June)



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- Air Marshal Vinod Patney • Lt Gen Narsimhan
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Vol. 12 No. 2, Summer 2017 (April-June)



CENTRE FOR AIR POWER STUDIES

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To be an independent **centre of excellence on national security** contributing informed and considered research and analyses on relevant issues.

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EDITOR'S NOTE

As this issue of the *Journal* is readied for the press, some notable events are taking place in the international arena. President Trump continues to make headlines. Much was expected of his first overseas tour. In the event, it cannot be called an unqualified success. In fact, quite the opposite. He started with Saudi Arabia where it was announced that the Saudis had committed to buy arms worth \$110 billion from the US. Later, it was stated that it was 'fake news'; negotiations on arms deals was work in progress. Possibly, more importantly, in Saudi Arabia and on his tours in West Asia, the impression was given that the US was in favour of giving more strength to the Sunni Muslim movement and against the Iran-led Shia sect. The need for the Muslim countries to fight terror was also stressed. We are yet to see the backlash to the US approach but the intensity of severing of ties between Saudi Arabia, etc, and Qatar has certainly muddied the waters. Incidentally President Trump has favoured the move. Could this lead to a schism in the Sunni fold? Time will tell but it is unlikely that seasoned politicians will fall prey to such baits so easily. Another major announcement made by President Trump is that the US will withdraw from the Paris accord on climate change. The announcement created the expected ripples. His tour of Europe also raised many eyebrows. In short, the happenings in the last few weeks have created ferment in international relations.

Terrorist activities continue apace. Terror attacks have caused widespread suffering and a large number of casualties in, *inter alia*, Iran, France, the UK (twice in a week), Afghanistan and Pakistan. The situation in Kashmir is also far from peaceful. The world is seeking a solution to such wanton killings but with little to show for it.

Whilst the aforesaid concerns occupy the headlines, this issue of the *Journal* examines seemingly less 'eye catching' but some important aspects that impinge on national security.

The subject of our higher defence organisation in India has excited many minds for many years. Numerous views have been propounded, including those that have not really been thought through. All those that write and speak on the subject are, indeed, interested in greater efficiency and effectiveness of the armed forces. It should be taken for granted that nobody has an axe to grind. It is true that thought processes are a result of personal experiences, discussions and readings. However, it must be emphasised that we should not just adopt what some other countries have introduced but look at our own requirements. The subject is far too important for a government fiat to impose a system. A unanimous approach will make the system work much better. And unanimity is a worthy objective to work for. Over the many decades that the subject has been under discussion, on some issues, unanimity has been achieved. It is to be hoped that agreement will be reached on more issues. Towards this end, the lead article in this issue of the *Journal* questions whether major surgery is indeed warranted in our higher defence organisation. The author argues that whilst some changes should be welcome, major surgery is not necessary.

China announced that it would effect major military reforms in December 2015. As with most Chinese pronouncements, the world sat up and took notice. Any number of articles, writings and commentaries followed. Military reforms are an ongoing process in all countries but it behoves us to study the possible impact of the reforms. **Lt Gen Narasimhan** is a noted expert on China and has incisive knowledge about the country. He looks at the history of military reforms in China, the underlying philosophy, the impetus behind the salient changes in the offing and the impact on India. The reader may have read a number of articles on the subject but none that is so complete, clear and all encompassing.

Foreign policy and military capability are two sides of the same coin. Air power came into its own with heightened capability but a few decades

ago. Yet, its impact was so emphatic that it became a tool of foreign policy. The impact increased with the expansion of tasks that it could perform and the demonstrated ability to do so efficiently and effectively. As air power matured into aerospace power, it started to impinge on the sovereignty of nations as well. In a scholarly article, **Air Mshl Mukul** takes us through the growth of aerospace power, the notable milestones and the number of occasions it has both fashioned foreign policy and supported it. Multinational and bilateral exercises, UN peace-keeping operations, Humanitarian Assistance and Disaster Relief (HADR), and many other examples can be quoted that furthered our national objectives.

When Unmanned Aerial Systems (UAS) were first used for military purposes, they were considered to be a technological marvel. UAS have now mushroomed much more than what could have been imagined only a few short years ago. With the growth in numbers, air space management issues and safety concerns have come to the fore. Regulations are essential and a number of agencies have been grappling with the problem. More complications have been added with civil use of UAS for business and commercial interests, use of Unmanned Combat Air Vehicles (UCAVs) and the impending entry of semi-autonomous and, may be, autonomous UAS as well. **Air Vice Mshl Bahadur** has taken a holistic view and the article covers many varied areas, including legal issues that are bound to take their toll. In another article on UAVs, **Gp Capt Narang** takes a different tack. In a fairly lengthy and informative article, he looks at our efforts at indigenisation of UAV manufacture. He describes the work done so far, and recommends a course of action.

Jointness, or the lack of it, has been the bane of our armed forces. In a well researched and equally well written article, **Wg Cdr Nijjar**, uses quotes and events to describe the turf wars amongst the Services but mentions success stories too. To promote jointness, a prerequisite must be that the 'I know best' syndrome should be shunned. His recommendations are worthy of consideration. The article should be required reading for all air force officers in particular and all others interested in military aviation.

Jai Raina displays maturity well beyond his years. In the concluding article in this issue, he analyses the Comprehensive Convention on International Terrorism which India proposed as early as 1996. Unfortunately, in spite of the increase in terrorism, the convention has remained deadlocked. The author, in a very readable article, discusses how India has been the victim of terrorism almost since our independence and how we have continued to lend strong support to the convention. Hopefully, our continued efforts will lead to some progress in the near future.

Happy reading.

A handwritten signature in black ink, appearing to read 'Jai Raina', with a small flourish at the end.

DOES HIGHER DEFENCE ORGANISATION IN INDIA REQUIRE MAJOR SURGERY?

VINOD PATNEY

Required changes in the higher defence organisation in our country are a subject of near constant debate. Many, and diverse, views continue to be aired. A common denominator seems to be dissatisfaction with the existing state of affairs. The need to improve on existing templates is a laudable thought, but do we require major surgery? Also, must we be taken in by examples of systems that obtain in other countries or should we seek solutions that are more appropriate to our circumstances? Should we blindly ape what others do or use our genius to fashion systems that are more applicable to our needs? What are the changes that could be introduced to advantage? This article addresses these questions and more. The views expressed are personal and not parochial but they are, possibly naturally, based on the experiences of a lifetime of service in our air force.

Before any form of surgery to our defence organisation is countenanced, it behoves us to diagnose what ails the system. We have won all the wars we have fought, less the 1962 conflict, and that should by itself be sufficient to show that our organisation is not too bad, it works almost every time. If the military organisation is established primarily to prepare

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the armed forces to win wars, our system has stood the test of time. In 1962, our problem was lack of intelligence, lack of adequate preparation and we were surprised by the Chinese attack. Possibly, we were also unsure as to how to wage that type of war. Be that as it may, the point must be made that, given the circumstances, no different higher defence organisation would have turned defeat into victory. Thus, the results of the wars that we have fought do not make a case for a major change in our organisation.

Undoubtedly, there are ills in our system that should be addressed. Our procurement system is slow and laboured. Jointness amongst our Services could be better. Also, the relations and mutual confidence of the Services, on the one hand, and the Ministry of Defence, on the other, should improve. Regrettably, one possible cause for the state of affairs is inadequate understanding of the other('s) point of view and, may be, even some suspicion of intentions. The solutions to bring about improvements stare us in the face. We need greater understanding and appreciation of differing viewpoints. We must not ever forget, even temporarily, that we are on the same side. To my mind, it is a mental challenge and not an organisational limitation. We can, by mere intent, make the system work much better. That is what we should do.

The ongoing debate on higher defence management largely deals with three issues, namely:

- The need for the armed forces to become part of the government and active players in decision-making. Also, for greater understanding to develop, armed forces officers should occupy berths in the civilian hierarchy and vice versa. This should be done at both middle and senior levels.
- Need for a Chief of Defence Staff (CDS) or a Permanent Chairman Chiefs of Staff Committee (PCCOSC). What should be his duties and responsibilities?
- Should we adopt the Theatre Command system?

The three issues require examination individually.

CIVIL-MILITARY INTERACTION

The proposals regarding cross-postings appear attractive and have some merit. They will promote better understanding as long as there is a mutual desire to cooperate and personalities do not undermine the system. Also, we have to be selective in determining the berths that the deputationists could occupy. More importantly, it is not desirable for those posted from outside the system to be given decision-making responsibilities. They would lack the basic knowledge and instinctive understanding of systems in vogue. The best we can hope for is that they would provide in-house domain knowledge. That will be of benefit unless the advice rendered is only subjective. That could happen. Again, the deputationists may find the work culture somewhat alien and will have to get used to a new work ethos on joining the new organisation and again when they revert to their parent Service. Another drawback is that as the deputationists will have to revert to their parent Service, they may elect to air only parochial views. The proposal to introduce deputationists has its limitations but the advantage of ready availability of professional advice has considerable value and should be encouraged, with the personnel warned of the pitfalls, and guided to overcome them. The great plus point of the proposal is that it can be readily implemented without introducing any major changes and the system can be easily modified or even abandoned at will. Another thought that could be considered is that where independent advice from more experienced officers is needed, it may be advisable to elicit the help of recently retired senior officers whose knowledge is still fresh and who may not always agree with the views of their parent Service.

The other issue is the advisability of making Service officers a part of the government and giving them decision-making responsibilities that are traditionally enjoyed by the civil servants. The thought process behind the proposal is that Service officers, with their professional knowledge, will better understand the needs and thereby hasten the decision-making process, particularly in procurement of hardware. Here, three issues merit examination. First, supposed inefficiencies cannot be cured by mere change

from civilian officers to Service officers manning the berths in the Ministry of Defence. There is a system in vogue that is tried and tested, and whilst improving on it must remain an ongoing process, major changes could be counter-productive. Second, and more important, the essential requirement is training for the post and continuity in the post, not who mans it. It is recommended that a high percentage of civil servants in the Ministry of Defence should have had sufficient exposure to the armed forces either when they join, say by spending a year or two in the armed forces units, or whilst in service. That will foster greater understanding of Service systems and requirements. Third, and most important, conscious efforts should be made to better understand the other side of the picture and that will foster the belief that all are on the same side and working in individual ways towards a common goal. The tendency that should be eschewed is the belief/conviction that appointment to a post makes for instant expertise. Seeking advice and understanding is neither demeaning nor a sin.

For better interaction of Service and civil functionaries, major changes in organisation are unwarranted. Incremental improvements should be a continuous process. However, it must be emphasised that all should recognise that an organisation cannot function better than the capabilities of the people manning it.

CDS/PCCOSC

For the rest of this article, the terms CDS and PCCOSC are used interchangeably and imply that both designations will carry similar responsibilities. The CDS will be supported by the existing Integrated Defence Staff (IDS) and the extant duties of the IDS will devolve on the CDS. The writings on the duties of the CDS refer broadly to the following responsibilities:

- He will be the single point of contact for military advice or on matters military.
- Administering the Strategic Force Command (SFC). Whenever other tri-Service commands like the Special Operations Command, Cyber Command or Space Command are set up, the commanders of all these commands will report to the CDS.

- The CDS and his staff will ensure greater efficiency and effectiveness in the planning process. This should include both procurements and operational planning.
- The CDS will help foster greater jointness amongst the Services.

As per existing norms, the IDS reports to the chairman, Chiefs of Staff Committee (COSC) and so do the commanders, SFC and the tri-Service Andaman and Nicobar Command. One difference is that unlike in the case of the proposed CDS, the chairman, COSC, is not designated as the single point of contact on military matters. The chairman is also a rotational appointment and rapid changes have occurred in the past, changes that are viewed by some as militating against the minimum desired tenure to permit continuity. However, it is argued that the system has been operating for many years and the very experienced chairman, COSC, backed by so many three-and two-star officers and a considerable staff that comprises the IDS, should not have any difficulty in undertaking additional responsibilities. Hence, it is opined that the current system should be left unchanged for the moment. As and when new tri-Service Commands are established, the institution of a permanent chairman makes sense. He would then be required to oversee and control the functioning of the tri-Service Commands to meet the needs of all three Services. The chairman, COSC, may find the workload of overseeing the work of three or four additional commands whilst retaining the responsibilities of his parent Service somewhat excessive. Should the task of the PCCOSC also include the four responsibilities mentioned above? The paragraphs that follow address the question.

CDS AS SINGLE POINT SOURCE FOR MILITARY ADVICE

On the face of it, seeking professional advice from only a single source on all military issues appears to give the source inherent super human powers of in-depth understanding of all the issues concerning the armed forces. This is beyond what can be expected of a mere mortal. The concept is flawed. We are in an age of specialisation and super specialisation and whilst generalists have their place, it will always be prudent to seek

advice from the source best qualified to provide it. This is particularly so in the case of operational plans and recommendations. The same holds true for procurement recommendations. Corporate decision-making has many advantages. A single individual cannot be the person to be contacted in every case. If a system of single source of advice is adopted, the CDS would often have to seek professional guidance from others. His recommendations would be based on second-hand information, and if a discussion ensues or supplementary issues arise, the CDS will be hard pressed to make the best views available. It should also be recognised that, in the absence of adequate data, and that is often the case, one has to rely on intuition, and intuition is a product of first-hand experience. There is no substitute for experience. Be that as it may, it is also more than likely that the views of the CDS may, even unintentionally, be biased. We can, and should, do better. Each Service has its core competencies and that fact should be accepted by all. Within each Service, there are sub-specialisations, and in each case, there will probably be more than one expert. Even the head of a particular Service often seeks the views of more than one individual, and discusses the pros and cons of differing thoughts before arriving at a plan or a recommended course of action. If this obtains in a single Service environment, the situation is far more complex in inter-Service considerations.

One more issue merits consideration. The CDS would be from one of the three Services and it is inadvisable to make him responsible for the conduct of operations. That should remain in the realm of individual Services. This cannot be overemphasised. The CDS would seek views from the heads of the three Services and he would be more agreeable and amenable to advice from the heads of Services that are not his parent Service. However, differences of opinion could arise where his thinking is considerably different from the head of his parent Service. An avoidable piquant situation could arise.

The concept of the CDS providing a single point of advice should be considered as stillborn.

STRATEGIC FORCE COMMAND

The Strategic Force Command draws support from all three Services. There is also a need for administrative control of, and administrative support to, the command. As it would be somewhat problematic for the commander SFC to deal with all three heads of the Services, his reporting to the chairman, COSC, or CDS or PCCOSC stands to reason. However, it is a moot point as to whether any form of operational control should be exercised by the chairman, COSC. In our system, for very good reasons, we have a clear separation between the control and conduct of conventional operations, on the one hand, and the preparation for, God forbid, a nuclear war, on the other. It is imperative that the separation is maintained. The two are very distinct levels of conflict and must be dealt with separately. We must shun the thought that use of a nuclear weapon is a possible extension of conventional military conflict. In our scenario, the sole purpose of nuclear weapons is to deter the use of such weapons against us. That must remain the cardinal principle. Again, for good reasons, the security attached to matters nuclear must be of a decidedly higher order and we should do whatever is possible to ensure that the systems we adopt are such that no classified information is even inadvertently compromised. Hence, it is strongly recommended that the operational control of the commander, SFC, should be exercised by either the National Security Adviser (NSA) or the Executive Council of the National Command Authority (NCA). In fact, it would be advisable if the commander, SFC, is invited to become part of the Executive Council.

EFFICIENCY AND EFFECTIVENESS OF THE PLANNING PROCESS

The IDS was intended to be the staff of the CDS. Even without the CDS, the IDS reports to the chairman, COSC. It has been nearly 16 years since the IDS was created (October 2001). By now, the teething problems should be over and the organisation well settled to oversee inter-Service issues. Unfortunately, the organisation has morphed into an entity by itself instead of using the very great expertise posted to it to iron out inter-Service differences. The greatest contribution that the IDS can make is to find solutions to vexing problems that will be acceptable to all. It must also

help find common ground when there are serious differences of opinion. That has largely eluded us.

The Defence Intelligence Agency (DIA) of the IDS has done good work in providing joint intelligence assessments. It is now a respected organisation. The IDS has also been successful in finalising a Defence Space Vision. Many joint committees have been created for better functional efficiency. Some air defence issues have found solutions. A joint doctrine for the Services has also been released. All these are not seriously contentious issues. For instance, the doctrine does not carry a high security grading and must be guarded in its approach. If a doctrine is defined as a set of beliefs, it has little value in formulating either procurement or operational plans. At best, it can lay down broad concepts and basic principles on the conduct of operations. Is a doctrine always implementable? Possibly the answer is in the negative. No doctrine can cater to varied contingences and can never be a diktat on how to wage wars. Security considerations will prohibit that. Again, the release of a joint doctrine does not automatically imply that it is a stepping stone to the establishment of the CDS and/or Theatre Commands. At best, finalising a joint doctrine is a small step and, may be, shows that on issues that do not pertain to procurement or operations, a unanimity of views of the three Services can be obtained even if it is time consuming. That is inadequate.

The major task of the IDS should be to fashion and control the procurement system and to formulate operational plans. Over the years, the IDS has worked hard to streamline the procurement process. It has introduced checks and procedures to ensure that the Defence Procurement Procedure (DPP) is adhered to. On many occasions, it has made sure that a common approach and recommendations are presented to the Defence Acquisition Council (DAC). Some good work has also been done towards finding commonality in equipment purchases and in making a single approach to the vendors; independent approaches by different Services for the same equipment, as often happened in the past, should not recur. All this is to the good but is not sufficient.

The IDS does little to formulate the requirements for the Services. The Long-Term Perspective Plans of the army/navy/air force are worked out by

the individual Service supposedly on the basis of net assessments prepared by the concerned directorate in the IDS and the plan forwarded to the IDS. The IDS merely collates the plans and produces a document titled the Long-Term Integrated Perspective Plan (LTIPP). It is intended to be a joint plan on the basis of which purchase proposals can be readied. As it is, the IDS does not examine if the proposals in the individual plans are indeed based on the net assessments. Again, in the integrated plan, there are no recommendations made on prioritisation of purchases. There is little application of mind. Different views are not sought and thereafter examined to arrive at concrete and studied recommendations that can be defended. There is little examination as to whether the purchases sought by the different Services are conducive to joint operational plans. In this way, the authority of the Services is not undermined but the LTIPP can hardly be called a joint plan.

The major limitation in the system followed is that a joint procurement plan cannot be made based on individual appreciations of what the net assessment forecasts. The starting point has to be joint planning. A systematic approach towards this end is needed. It is recommended that each Service is tasked to work out, in cogent terms, its capabilities whilst operating on its own and in conjunction with the other Service(s). This must be the first step. Thereafter, joint planning should be carried out for the contingencies that flow out of the net assessment or any other contingency. Such joint planning should carry the commitment of each Service that it will be able to effect what it says it can. That will make the planning more meaningful as there will be an inherent quasi guarantee of success. The implicit understanding should be that if it becomes necessary to put the plans into practice, no Service will make excuses for performance that is short of what was projected earlier as capabilities. Accountability must be ensured. The planning will, thus, be more realistic. More importantly, it will be a joint plan and point the way towards training requirements. It is granted that this will be an involved and continuous process, but the results will be worthwhile. The plans will automatically throw up immediate procurement needs and prioritisation of procurements in the years ahead. Most importantly, the operational plans and the subsequently arrived at procurement plans will have the concurrence

of all three Services. If we are to attenuate inter-Service rivalry, the start should be with operational planning that is based on reality rather than imagined capabilities and requirements. Good jointness will be a byproduct that will strengthen with time. Joint formulation of strategy and tactics and the consequent operational planning cannot but foster better understanding and better jointness.

Some could argue that the procedure suggested is much too simplistic, and warfare is far more complex. The author wholeheartedly agrees. For security reasons, details have been omitted. Also, as the system is fielded and begins to operate, improvements will suggest themselves. A planning system is an evolutionary process. But it bears mention that everyone accepts that joint planning is a prerequisite for effective prosecution of a modern war, and progressive modernisation is essential. The procedure outlined meets both requirements. A logical approach has been recommended: first plan and let the planning process decide on procurement priorities. It must be again emphasised that the planning process has to be complex and ongoing. It is not a one-time activity. Security considerations will arise but as the planning, by itself, is carried out jointly but the prosecution of plans devolved to individual Services, the security issue can be contained. Again, as there will probably be many plans and sub-plans for each contingency, security would be strengthened as the choice of the plan to adopt will be taken at the last moment. A full-time planning team is needed and the work of this team will be as important during peace as it will be during a war.

The procedure outlined has not been attempted so far and it is likely that it will be met with strong resistance. Possibly, a governmental push may be required. It has often been mooted that a governmental push is needed to introduce changes in the higher defence organisation. The author argues that a push towards joint planning will work better. Not only is planning for possible wars and how to prosecute them the bread and butter of the armed forces, but the plans generated and the manner in which the wars should be fought will automatically indicate the optimum organisation that will be most suitable. Such a study will be based on

inputs that are more germane to the armed forces and are as realistic as possible, as opposed to expressions of imaginary needs and fears. May be, no real changes will be required.

When the IDS was created 16 years ago, it was hoped that better inter-Service cooperation would result. Unfortunately, that has not happened. Turf battles continue even within the IDS. If 16 years of the IDS' existence and a manning level of some 300 officers, drawn from all three Services, headed by an officer of vice chief status who is supported by five officers of three-star Principal Staff Officer (PSO) status and another 24 two-star officers have still left so many shortcomings, as mentioned in the earlier paragraphs, possibly the problem is neither administrative nor organisational. Instilling of jointness may be the essential requirement. Is it time to think *de novo*?

JOINTNESS

Innumerable articles have been written, and discussions held, on the absence of jointness in the armed forces and the overriding need to instill it. Unfortunately, jointness means different things to different people. Remedies abound but jointness has remained elusive. It was thought that with institutions like the National Defence Academy, Defence Services Staff College and the other inter-Service organisations, greater understanding would occur, and jointness would automatically follow. Such optimistic thoughts have been belied. We have been unable to get rid of 'turf wars'. This is in spite of the fact that with joint training institutions, greater bonhomie amongst the Services has come about but jointness is a long way off.

There have been occasions when the Services have been in agreement and have put up joint recommendations but these relate essentially to administrative issues like Pay Commission awards, and the like.

Our history of conflicts since our independence shows that the level of cooperation should have been better. A few examples are:

- In the Kashmir War of 1947-48, despite the prime minister's advice to the army chief on the importance of Skardu, his air counterpart was not informed and this delayed the supplies to the besieged and beleaguered garrison. That led to the surrender and consequent massacre of the garrison.

- In 1962, while the government did not permit use of combat air power which had been deployed and was fully ready for any contingency, the phenomenal and back-breaking effort by the air transport fleet was wasted due to the poor selection of dropping zones, especially at Longju and Tsangdhar. Their unsuitability was conveyed by the Air Officer Commanding-in-Chief (AOC-in-C) to the corps commander but the former was overruled.
- There was little joint planning before and during the 1965 Indo-Pak War. The Indian Air Force (IAF) leadership was not aware of the army's plan and could not mesh its plan with that of the army. Possibly, this resulted in the fizzling out of a quick advance by the army in the Lahore sector on September 6, 1965. The air effort was available for supporting the land forces but the demands either were not raised or were rejected by the Joint Anti-Aircraft Operations Centres (JAAOCs). This resulted in utilisation of aircraft to around one sortie per aircraft per day against a planning figure and availability of three sorties/aircraft/day.
- The Jaffna University heli-drop, soon after the induction of the Indian Peace-Keeping Force (IPKF) into Sri Lanka in 1987 was a disaster and resulted in very heavy but avoidable casualties, mainly due to lack of joint planning. The situation changed remarkably with the setting up of Headquarters, Indian Peace-Keeping Force (HQ IPKF) at Madras and of an air force cell therein.

This is a sad story as one should have expected that we would have learnt lessons from each conflict and cooperation would have improved progressively. Some improvements did take place as in the case of the 1971 and Kargil conflicts, but, largely, an unsatisfactory situation continues to prevail. This is in spite of a 16-year experiment with the IDS and the unified Andaman and Nicobar Command (ANC).

Three issues militate against better jointness amongst the Services. First, there is a lack of adequate understanding of the operational thinking, strengths and limitations of the other Services. This is particularly true for knowledge about the air force. The capabilities of the air force are not well

known and, hence, the expectations are not realistic. What makes matters worse is that air power is inherently difficult to understand. When the air force says that it is unable to perform a task, it is sometimes mistaken for the air force not wanting to do so. It is a historical fact that the air force has always come forward to support the army or navy but, at times, this fact is not appreciated. On the other hand, the ubiquitous nature of air power is appreciated and there is a clamour for an air force under command. This goes against the basic principle in the utilisation of air power—unity of command. Jointness will remain elusive unless such cardinal issues are understood.

Second, in spite of so many years of seeking jointness, the roles and missions of the individual Services have not been defined and the core competencies have not yet been stipulated. It must be done post haste. This is an essential prerequisite. Three independent Services have been created because they have different attributes and core competencies. In the absence of stipulations of core competencies and defined roles, attempts to encroach into the other's domain will continue. Such attempts, often without informing the concerned Service, cannot but create bad blood. It is akin to poaching on the territory of a sister Service. 'Must guard our turf' has become a way of life. Once again, it is the air force that bears the major brunt of the 'attempted encroachment'. Once the core competencies, roles and missions of each Service are well defined and enforced, hopefully by a governmental fiat, 'attempted encroachments' should cease. *In the view of the author, a governmental order stipulating the core competencies, roles and missions of each Service is the single most important remedy to bring about jointness.* With better jointness, better cooperation and coordination will follow.

Third, by its very nature, air power has a role to play, often a decided role, in all types of operations. As a result, it is much in demand. The Service that needs air power often does not recognise that the air force capability is finite. It happens that, at times, the air effort is not available in sufficient quantity. There can be many reasons for this, from availability to weather to need for prioritisation of available effort, etc. However, this is not understood, and bad blood is created. Worse, there is a clamour for air power under command. What is not recognised is that if the demands for air assets that another service

seeks are made available to the air force, better availability and utilisation will result as flying operations are without doubt the core competency of the air force. With duplication, the command and control and air space management issues raise their ugly heads and give cause for more disagreements.

Possibly a fourth factor is the desire to have all support functions under command. It is but obvious that such an approach is not conducive to enhanced jointness.

Implicit in the four factors described above is the remedy to right the wrongs. One issue that will probably transcend all others to bring about jointness is joint planning. The basis of joint planning has to be recognition of core competencies and an understanding of the roles and missions of each Service. Again, this factor cannot be reiterated or reemphasised often enough. Joint planning will also bring to light the availability of resources and an understanding of how and why the poverty should be shared. Besides all this, it is a foregone conclusion that we must fight together. Some 15 years ago, the author had opined that *far more important than planning for joint operations is joint planning for operations*. This is not a play on words but an important factor. The author still stands by it, and argues that joint planning is the single most important aspect for inter-Service cooperation. It is possible that in some circumstances, a single Service operation is the best option. A single Service operation is indeed a valid operation of war as long as it is the result of joint planning. Meaningful and continuous joint planning will bring about jointness.

THEATRE COMMANDS

There were two occasions in independent India when a unified command system was adopted. The first was during the IPKF operations in 1987 (briefly referred to above). In the early days itself, the army commander elected to task helicopters for a helicopter drop of army personnel at Jaffna University. The air force element was against it, calling it far too risky, but was overruled. In the event, all the helicopters were damaged. More importantly, a number of lives were lost. Almost immediately thereafter, an air component commander was positioned to take charge of the

deployment and tasking of air assets. The air force elements continued to support the operations but under the control of the air commander. The unified command system was a failure, and was discontinued with.

ANDAMAN AND NICOBAR COMMAND

The second instance relates to the formation of the unified Andaman and Nicobar Command. The command was set up in October 2001. One of the objectives was to establish the viability of a Theatre Command. The functioning over the last 16 years does not give confidence that a Theatre Command system will be of benefit.

The unified command has not succeeded in fostering jointness. Reportedly, inter-Service rivalry is as strong as ever. Personnel of each Service have to follow the rules of the parent Service even if they are markedly different from the others. Commonality has not been ensured. The authority of the Commander-in-Chief (C-in-C) is undermined as he can try disciplinary cases only of the personnel of his parent Service. The personnel of the other Services can be tried by the senior officer of the Service in the command but if the case has to be referred to someone senior, it is so referred to the respective Service HQ. Such a situation is not conducive to good discipline. There is no combined maintenance organisation—each Service has its own. A common communication system does not exist. The Service HQ, possibly perforce, has to deal with the component commanders, directly bypassing the HQ of the command. Land continues to be controlled by the parent Service and permission has to be sought from the HQ of the Service concerned for any planned utilisation. Permission is seldom granted.

The major lacuna is in the operational arena. The command has a clearly stipulated task but little means to meet the requirement. The forces deployed are meagre and it is a moot point if augmentation of forces, in terms of how many and when they can be expected, is inadequate. The C-in-C does not have enough forces under command to plan and conduct operational exercises and test the mettle of his personnel. One wonders how the command will fare in war.

The ANC does not have enough forces under command as more forces are unavailable. Such poverty sharing will be a regular feature if Theatre Commands are introduced. It will be difficult to carry out meaningful training and operational planning in many such commands.

It is recommended that the unified command be disbanded and we should revert to the earlier system of placing the forces under the concerned geographical command. In this way, the geographical commands will have to just add on to their responsibilities but will have the freedom to work out contingency planning and training schedules as a substantially greater force level will be available. If after 16 years, there are such drawbacks in the functioning of the command, it behoves us reconsider the setting up of a unified ANC and to seek other solutions.

NEED FOR THEATRE COMMANDS

An organisation or proposed organisation should be based on perceived needs. It is generally accepted that whilst we must prepare for a major war to create a deterrent capability, the types of conflicts in the near future are likely to be short duration or even near continuous, event-based, low level sub-conventional operations. For such operations, a mammoth organisation like a Theatre Command is a gross overkill.

Conventional wisdom also suggests that if a major war were to break out, it would be sharp, intense and last for 15 days, or so. In wars like this, air power will have a defining role. Such wars will demand concentration of air power at different locations, at different times, for different roles. The radii of action of modern-day aircraft can be as high as 1,500-2,000 km or more. This implies the ability and may be, the need, to hit targets at long distances, rapidly and repeatedly, including the ability to hit targets in the operational area of responsibility of more than one command. The aircraft may have to, probably will have to, transcend the geographical limits of other commands. Deployment of aircraft may have to be changed repeatedly, from one sector to another, depending on the progress of operations. History records how all this and more was done in previous conflicts even when our capability was nowhere

near as good as it is today. The situation becomes more complex if we add the actions carried out by the adversary. Air defence and offensive operations have to be conducted with effective synergy. All this must lead to the conclusion that air operations are markedly different from those of the other two Services in terms of expanse of areas of interest and rapidity with which operations can be mounted. Strategic agility is a byword of air power. Unity of command, with devolution of control, is an essential characteristic for effective use of air power, and must be respected.

The above paragraph should not give the impression that the air force will fight its own war. Far from it. It is again emphasised that joint planning is the name of the game. The joint plan will include the aforementioned tasks for the air force but not preclude other tasks. A Theatre Command system will introduce one more level in the control of air power and place a spanner in the work of air power, arguably the work of the Service that will have the most to offer. Most importantly, piecemeal use of air power has never yielded good results. This is particularly true when the forces available are few. There have been occasions in the past when control and tasking of particular aircraft in short supply was carried out directly by Air HQ. There can be others also when Air HQ will elect to exercise direct control over designated forces.

The underlying conclusion must be that a Theatre Command system will serve no useful purpose but would only impede the capability and potential of air power.

CONCLUSION

The author finds no justification for introducing either a CDS or Theatre Commands. Indeed, the argument is that it is contra-indicated. The essential need is for better joint planning that may have to be enforced by the government. At the same time, the cardinal requirement is that the government must take it upon itself to stipulate the core competencies, roles and missions of the three Services.

There are so many issues demanding the attention of the government and the armed forces. Modernisation requirements are urgent and so is the need for clear policies on space, cyber space, special forces, etc. These are weighty issues that should be progressed at speed. Unnecessary impediments like discussions on the CDS/Theatre Commands should be put to rest, once and for all. We need improvements to our higher defence organisation, not major surgery.

CHINA'S MILITARY REFORMS

SL NARSIMHAN

INTRODUCTION

China announced major military reforms in December 2015¹. Ever since that time, every China watcher in the world has been paying attention to what is happening in the People's Liberation Army (PLA). Many analysts are of the opinion that Xi Jinping announced these reforms in order to tighten the Chinese Communist Party's hold on the PLA.² A closer scrutiny of the events that have been taking place since the beginning of this century will prove that this assumption is not true. In the year that has gone by, the PLA went hammer and tongs at these reforms and seems to have made good progress. The aim of this article is to trace the history of military reforms in China, analyse the present military reforms, and draw some lessons for India.

MILITARY REFORMS IN CHINA

The PLA is not new to military reforms. With every generation of leadership, there have been some reforms. It is also true that the war-fighting doctrine has undergone changes with every generation of leadership in China. Changes

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1. Michael Chase, Jeffrey Engstorm and Roger Cliff, "China's Military Reforms: An Optimistic and a Pessimistic Take", The CSS Blog Network, Centre for Security Studies, ETH Zurich, December 20, 2016. Available at <http://isnblog.ethz.ch/defense/chinas-military-reforms>, Accessed on March 12, 2017.
2. L Jing, (2015), "China's Sweeping Military Reforms Strengthen Grip", *South China Morning Post*, December 28, 2015, Available at: <http://www.scmp.com/news/china/diplomacy-defence/article/1895525/chinas-sweeping-military-reforms-strengthen-grip>, Accessed on March 12, 2017.

What is different this time is the mega scale at which the reforms have been conceived and are being implemented. The latest reforms, if implemented successfully, will change the entire structure of the PLA.

in the number of troops or Military Regions (MRs) have been occurring at regular intervals. However, what is different this time is the mega scale at which the reforms have been conceived and are being implemented. The latest reforms, if implemented successfully, will change the entire structure of the PLA.

Before we analyse the present reforms, it will be pertinent to look into the reforms that the PLA has already undergone since its inception in 1949. Though the PLA traces its origin to August 1, 1927, the PLA of today has evolved from the time the People's Republic of China (PRC) came into existence on October 1, 1949.

Reforms during the First Generation Leadership

Mao Zedong, also known as Chairman Mao, and Zhou Enlai comprised the first generation leadership. During that generation, which ruled China for the longest time since it became a republic, the doctrine followed was of People's War³. The basic concept behind People's War was to maintain the support of the population and draw the enemy deep into the countryside (stretching its supply lines) where the population would bleed it dry through a mix of mobile and guerrilla warfare. The aim of this doctrine was to inflict unacceptable attrition on the enemy so that it would abandon the offensive. The People's War concept implied the active participation of the regular army and people's militia. The military strategy of active defence upholds war in self-defence, though strategic counter-offensive is permitted as preemptory strikes in self-defence at the campaign and tactical levels⁴. Simply put, it means a defender can seize the initiative through first strikes. During this period, the number of Group Armies (GAs) kept changing from six in 1940,

3. Mao Zedong, "Problems of Strategy in China's Revolutionary War" in M. Zedong, *Selected Works*, Vol. 1, December 1936, p. 238.

4. PK Singh, "Changing Contexts of Chinese Military Strategy and Doctrine", *Strategic Analysis*, March 2016, p. 48.

to 12 in 1954 (due to the Korean War), 13 in 1956, and 11 in the 1960s.

Reforms during the Second Generation Leadership

Deng Xiaoping, known as the paramount leader, discarded the People's War concept because the PLA suffered heavy casualties during the Vietnam War in 1979. During the tenure of the second generation leadership, two different doctrines were followed. Immediately after the Vietnam War, the People's War doctrine changed to People's War under Modern Conditions.⁵

It differed from People's War in the sense that instead of drawing the enemy deep into own territory, it aimed to defeat the adversary closer to China's borders. This doctrine also advocated defence of the cities so that the army could sustain itself logistically. This doctrine was not put into use. In 1985, the Central Military Commission (CMC) had an extended meeting in which Deng gave his view on future wars. Based on that, the doctrine of Local Wars under Modern Conditions was adopted. In the same year, the PLA's strength was reduced by 10,00,000 personnel. The MRs were reduced to seven.

Reforms during the Third Generation Leadership

The third generation leadership that comprised Jiang Zemin and Zhu Rongji, was at the helm of affairs from 1989 to 2002. This was the period which saw major reforms in the PLA due to the studies conducted after the first Gulf War. The doctrine was changed to Limited Wars under Hi-tech Conditions.⁶ Mechanisation of the PLA was started in a big way. This concept took

In 1985, the Central Military Commission had an extended meeting in which Deng gave his view on the future wars. Based on that, the doctrine of Local Wars under Modern Conditions doctrine was adopted. In the same year, the PLA's strength was reduced by 10, 00,000 personnel. The MRs were reduced to seven.

5. X Li, *China at War: An Encyclopaedia* (Santa Barbara, California, USA: 2012), ABC – CLIO, p.349.

6. Alexander Chieh-cheng Huang, "Transformation and Refinement of Chinese Military Doctrine: Reflection and Critique on the PLA's View", in James C Mulvenon and Andrew Wang, eds., *Seeking Truth from Facts: A Retrospective on Chinese Military Studies in Post Mao Period* (2001), pp. 131-140.

The number of GAs was reduced from 21 to 18. Conversion of divisions into brigades was started. This was resorted to because the PLA felt that divisions were heavy and could not adapt to changing situations in the battlefield. A PLA brigade is larger than a brigade in other armed forces, including India's, and its size varies, depending on the operational role.

vulnerable spot, launch the attack and achieve the political aim before the adversary could fully mobilise and orchestrate a campaign. The number of MRs remained seven. The strength of the PLA was reduced by 500,000 in 1997. A Non-Commissioned Officers (NCOs) cadre was established and the number of officers was reduced.

war beyond Chinese territory. The War Zone Campaign was conceived during the early 1990s. Post Deng Xiaoping's vision that he declared during the 1985 CMC meeting, it was clear that the PLA had to carry out the strategic transition from preparing for a total and nuclear war to a local and limited war. While it was contemplating this change, the 1991 Gulf War showed the PLA that it should be prepared to fight a medium sized local war. The War Zone Campaign implied that the war would be restricted to one strategic direction, fought with troops that were locally available with a small reinforcement, target the enemy's

Reforms during the Fourth Generation Leadership

The fourth generation leadership was represented by Hu Jintao and Wen Jiabao. One can attribute the present reforms to their time in power. The doctrine shifted to Limited Wars under Conditions of Informationisation. This change came about due to the way in which the war in Iraq in 2003 was orchestrated from the continental USA, and the realisation that informationisation was the key to winning future wars. During the process, the Chinese visualised the PLA till 2050. The 2006 Defence White Paper said, "China pursues a three-step development strategy in modernizing its national defense and armed forces, in accordance with the state's overall plan to realize modernization. The first step is to lay a solid foundation

by 2010, the second is to make major progress around 2020, and the third is to basically reach the strategic goal of building informationized armed forces and being capable of winning informationized wars by the mid-21st century.⁷”

The present reforms are the second step envisaged in that document. During the period of the fourth generation leadership, leapfrogging of mechanisation and informationisation were adopted. The three warfares (psychological, legal and media) concept came into force.⁸ An effort to graduate from joint operations to integrated

operations and trans-move of troops for support operations, commenced in 2006⁹. The number of GAs was reduced from 21 to 18. Conversion of divisions into brigades was started. This was resorted to because the PLA felt that divisions were heavy and could not adapt to changing situations in the battlefield. A PLA brigade is larger than a brigade in other armed forces, including India’s, and its size varies, depending on the operational role. Some 200,000 troops from the PLA, 90,000 from the reserves and 200,000 from the militia were reduced.

The Chinese way of war-fighting has been moving outwards from drawing the enemy deep into own territory to near China’s borders, into the adversary’s territory and beyond.

Start Point of Present Military Reforms

Contrary to the belief that Xi Jinping ordered the latest round of PLA reforms, a look into the Work Report presented by Hu Jintao to the 18th Party Congress suggests otherwise.

To address these problems and threats, we must make major progress in modernizing national defense and the armed forces. We must, responding to China’s core security needs and following the three-step development

7. China’s National Defense White Paper, Ministry of National Defence, People’s Republic of China, 2006

8. Abhijit Singh, “China’s ‘Three Warfares’ and India”, *Journal of Defence Studies*, vol. 7, no. 4, 2013, pp. 1-20.

9. J. S. Bajwa “Chinese Military Strategy: War Zone Campaign Concept”, *Indian Defense Review*, November 7, 2015.

strategy for modernizing national defence and the armed forces, ensure both economic development and development of defence capabilities, intensify efforts to accomplish the dual historic tasks of military mechanization and full IT application, striving to basically complete military mechanization and make major progress in full military IT application by 2020.

We should closely follow the new global military revolution that is gathering pace, advance reform of our national defense and armed forces in a both active and prudent way, and deepen military transformation with Chinese characteristics. With innovative military theories taking the lead, we should enhance our capacity for innovation in defense-oriented research and industries, modernize the military organizational structure, and build a system of modern military forces with Chinese characteristics.¹⁰

From the above discourse, three things emerge very clearly. One, the Chinese way of war-fighting has been moving outwards from drawing the enemy deep into own territory to near China's borders, into the adversary's territory and beyond. Two, military reforms in the PLA are an ongoing process except for the fact that the latest round of reforms are the mother of them all. Three, it is not correct to say that Xi Jinping has started these military reforms to increase or tighten his hold on the PLA, though that may result as a by-product of these reforms.

PRESENT MILITARY REFORMS OF CHINA

After Hu Jintao's work report to the 18th Party Congress reinforced the roadmap for China's military reforms in October 2012, the third plenum of the 18th Party Congress was held in November 2013, wherein the decision to plan and execute these reforms was taken:

... The plenum pointed out: we will endeavour to resolve the prominent problems that constrain the development of national defense and the armed forces, be innovative in developing military theories, enhance military

10. "18th CPC National Congress", Embassy of China in the US, November 27, 2012, available at http://www.china-embassy.org/eng/zt/18th_CPC_National_Congress_Eng/t992917.htm, Accessed on February 20, 2017.

strategic guidance, implement correct military strategy for the new period, and build a system of modern military forces with Chinese characteristics. For endeavour in this regard, the tasks listed include deepening the adjustment and reform of the military administrative set-up and staffing, promoting adjustment and reform of military policies and systems, and deepening the integration between the military and civilian sectors.¹¹

Reasons for These Reforms

The military reforms are proceeding as per the plan enumerated above. However, a number of reasons had come up to start these reforms in 2015. Some of the main ones are discussed in the succeeding paragraphs.

- Flaring up of the Senkaku Islands issue in 2012. China declared an Air Defence Identification Zone (ADIZ) in the East China Sea¹². However, it lacked the capability to effectively deal with the reaction to that situation and control the escalation.
- The Comprehensive National Power (CNP) of China has been increasing. As CNP increases, a country starts flexing its muscle in concentric circles extending outward. To do so, the armed forces of that country should have the capability and capacity to project power.
- China's diaspora is spread all over the world. Its economic interests are going global. The protection of the diaspora and economic interests is becoming increasingly important.

11. "Communiqué of the Third Plenary Session of the 18th Central Committee of the Communist Party of China" *Conference Proceedings*, Communist Party of China, 2014.

12. M Pilger, "ADIZ Update: Enforcement in the East China Sea, Prospects for the South China Sea, and Implications for the United States", *US-China Economic Security Review Commission Staff Research Report*, March 2, 2016.

The missions of the armed forces expanded from protecting the country's sovereignty, to safeguarding national interest frontiers; and their functions extended from home territory defence to protecting national interests, regionally or even globally.

- The Defence White Paper that China published in 2015 articulated the military strategy to cater for the increasing aspirations of China. The following points are of significance: China's national security interests were highlighted. These included the diaspora, China's interests in natural resources, and wherever China's investments are located.
 - Correspondingly, the missions of the armed forces expanded from protecting the country's sovereignty, to safeguarding national interest frontiers; and their functions extended from home territory defence to protecting national interests, regionally or even globally.
- Since the military reforms were in the offing, there was a need to structure the doctrines for the Theatre Commands.
- The erstwhile Military Regions system operations on a strategic front fell into the responsibility of more than one MR, thereby creating command and control problems. Therefore, to smoothen the functions, there was a need to superimpose an additional command level from the Central Military Commission (CMC). Moreover, the MR system was dominated by ground forces. It was very difficult to get the MRs to work towards joint operations.

Preparations for the Reforms

Having taken a decision in the Third Plenum of the 18th Party Congress to carry out the military reforms, a Leading Small Group (LSG) was set up under the chairmanship of Xi Jinping himself. The other two important figures in the LSG were Gen Xu Qiliang and Gen Fan Changlong.¹³ The interesting point to note in the leadership of the LSG is that Fan Changlong was senior in the hierarchy but occupied a lower position. The LSG met on January 27, 2015, and July 14, 2015. It made recommendations to the

13. B. Mingxin, "Xi leads China's Military Reform, Stresses Strong Army", *Xinhua*, March 15, 2015.

CMC, which met on July 22, 2015, and discussed the reforms. The reforms were considered by the Politburo Standing Committee on September 3, 2015, and approved by it. Finally, the CMC Military Reform Work Conference took place from November 24-26, 2015. The reforms were announced on November 30, 2015. Prior to the LSG making its recommendations, the opinions of 900 former officers and experts were taken; 690 field visits were carried out, 2,000 questionnaires were sent to field formations and units, and 800 seminars were held to get the opinions of the environment.¹⁴

The Goldwater Nichols Act devolved more powers to theatre commanders and placed them directly under the president of the USA. There is a variation between China's military reforms and the USA's Goldwater Nichols Act. That is, China's Theatre Commands are geographically located within the Chinese territory but the USA's are not.

Philosophy of the Reforms

The philosophy of the reforms is to focus on the home territory but projecting to the peripheries. Many analysts have compared these reforms to the Goldwater Nichols Act of the USA. The Goldwater Nichols Act devolved more powers to theatre commanders and placed them directly under the president of the USA. There is a variation between China's military reforms and the USA's Goldwater Nichols Act.¹⁵ That is, China's Theatre Commands are geographically located within the Chinese territory but the USA's are not. China may establish bases abroad in a number of places like Djibouti and Gwadar. Once that is done, China may also create Theatre Commands like the USA.

Reforms Per Se

In September 2015, prior to the announcement of the military reforms, Xi

14. D. S. Rajan, "China Announces Important Military Reforms Guidelines- Implications", Paper no. 6044, *South Asia Analyses Group*, December 5, 2015.

15. P C Saunders and Joel Wuthnow "China's Goldwater-Nichols?: Assessing PLA's Organisational Reforms", *Joint Force Quarterly* 82, July 1, 2016.

Jinping declared a reduction of 300,000 personnel from the PLA¹⁶. After the CMC Executive Committee meeting from November 24-26, 2015, major military reforms were announced. They fall under five main heads, as given below:

- **Higher Defence Organisation:** Disbanding the four general headquarters and creating 15 entities out of them which will directly function under the CMC.
- **Creation of a PLA Headquarters:** The ground forces did not have a headquarters earlier. The present set of reforms envisages creating one.
- **Abolishing the Military Regions and Creation of Joint Theatre Commands:** The seven erstwhile MRs were to be converted into five joint Theatre Commands.
- **Creation of a PLA Strategic Support Force (PLA SSF):** This force was to be carved out of the organisations from the General Staff Department, General Armament Department and General Political Department.
- **PLA Rocket Force:** The Second Artillery Corps was to be converted into the PLA Rocket Force and upgraded to the status of a full Service.

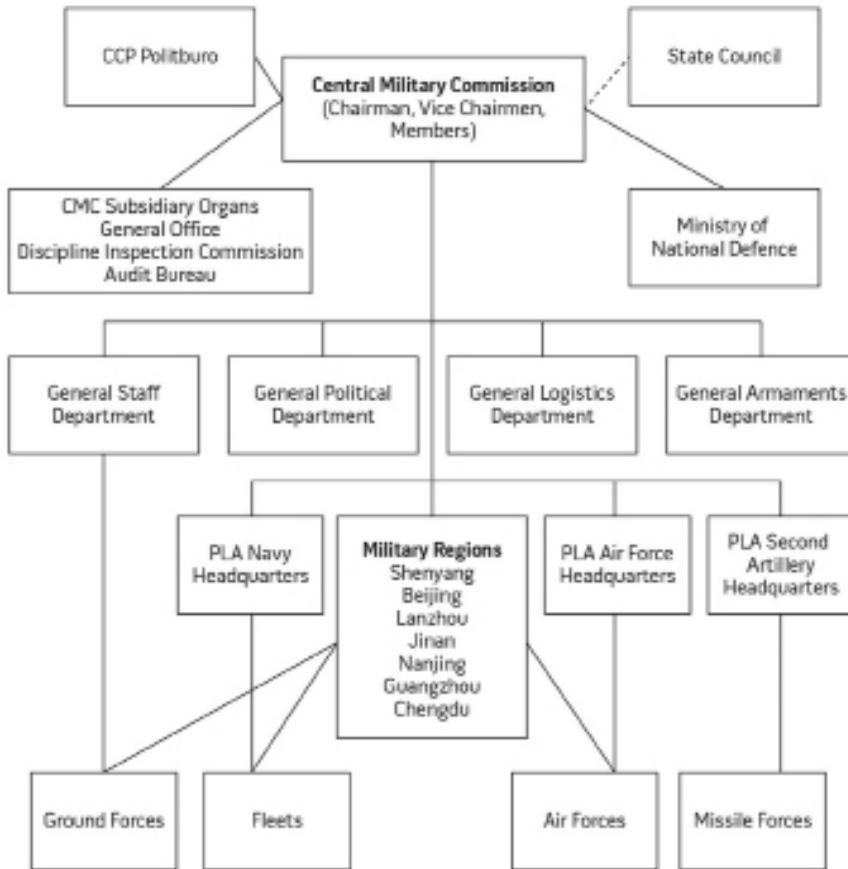
HIGHER DEFENCE ORGANISATION

- The four general departments, namely, General Staff Department, General Political Department, General Armament Department and General Logistics Department were present in all organisations till the regiment level. A regiment of the PLA is equivalent to a brigade in other armies. Since there was no headquarters for the ground forces, they were commanded through these four departments. It was felt that these departments were growing powerful and corruption was seen to be increasing. Moreover, these departments were dominated by the ground forces. In order to change all these factors, the four departments were converted into six departments, six offices and three commissions which would function directly under the CMC.

16. Chris Buckley "In Surprise, Xi Jinping to Cut Troops by 300,000", *New York Times*, September 2, 2015.

- The organisation prior to the reforms is given below:¹⁷

Fig 1: PLA Structure Prior to Reforms

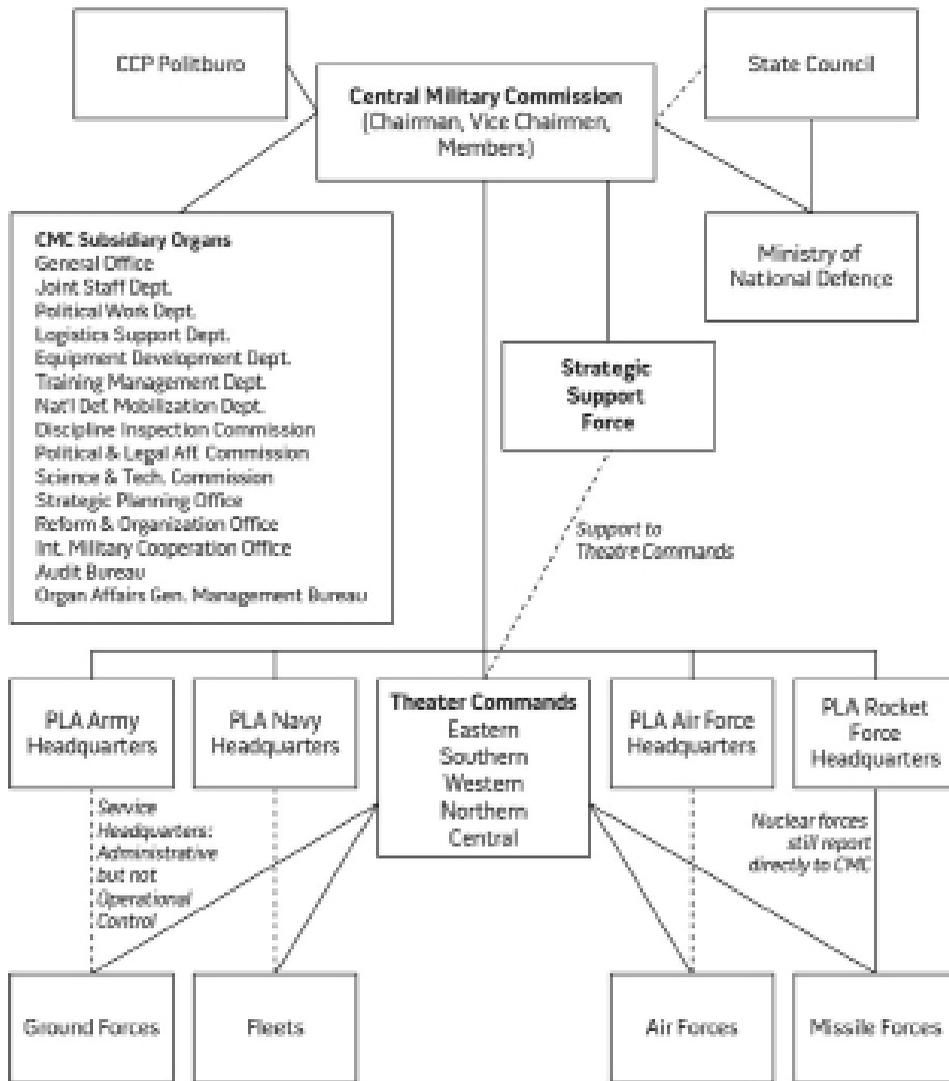


- The PLA structure post reforms is given below¹⁸:

17. Saunders et. al., n. 15.

18. Ibid.

Fig 2: PLA Structure after Reforms



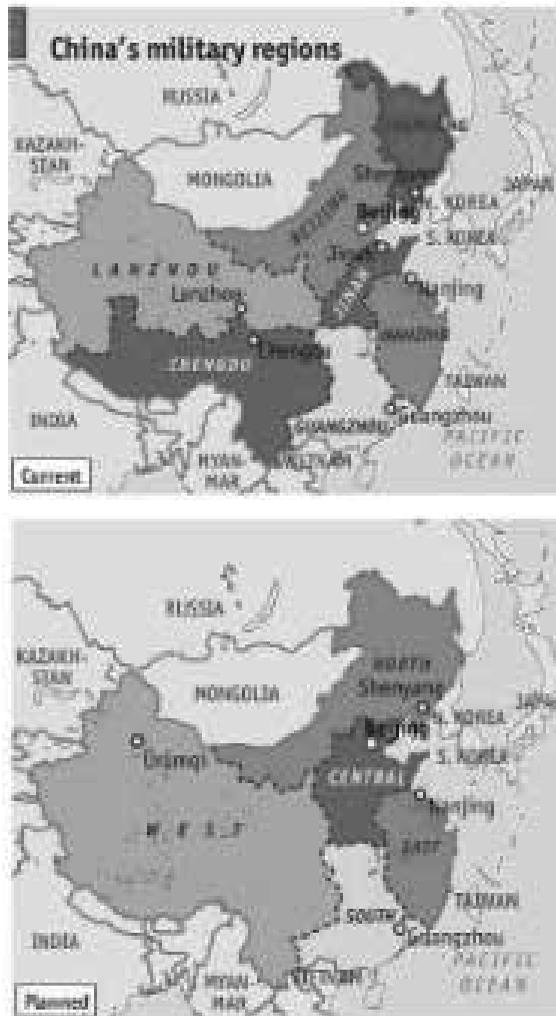
The PLA Headquarters

The PLA Headquarters has been created. However, it will have no operational control over the Theatre Commands. It will be responsible for the manning, equipping and training of the ground forces.

Creation of Joint Theatre Commands

The seven MRs have been converted to five Theatre Commands. The territory of China has been divided geographically into these five Theatre Commands. The same has been depicted in Fig 3 below.

Fig 3



Source: South China Morning Post

Each Theatre Command has a PLA HQ and a Joint HQ. Surprisingly, they are not co-located. It appears that in order to speed up the reforms, China seems to have utilised the existing infrastructure. However, in the long run, this geographical separation is likely to adversely affect the functional efficiency. Fig 4 depicts the locations of the PLA HQ and Joint HQ in each Theatre Command.¹⁹

Fig 4



The role of the Theatre Commands is three-fold. One, responding to security threats from their strategic directions; two, maintaining peace, deterrence against adversaries and winning battles; and, three, safeguarding the overall situation with respect to national security and military strategy. The area of responsibility of each Theatre Command is given in Fig 5.²⁰

19. M Salvacion, "Insider Discloses Location of New Military Commands' Army HQs" *Yibada*, February 5, 2016, available at <http://en.yibada.com/articles/102441/20160205/insider-discloses-location-of-new-military-commands-army-hqs.htm>

20. G. Arthur (2016), "PLA Theatre Commands Outlined", *Shephard*, September 8, 2016, available at <https://www.shephardmedia.com/news/defence-notes/pla-theatre-commands-outlined/>

Fig 5



CREATION OF PLA STRATEGIC SUPPORT FORCE

Among all these reforms, the most important one is the creation of the PLA Strategic Support Force (SSF). As Xi said, during the inauguration of the PLA SSF, “The Strategic Support Force is a new-type combat force to maintain national security and an important growth point of the PLA’s combat capabilities.”²¹

Organisation and Capabilities of PLA SSF

The PLA SSF is not a full-fledged Service. This new force is likely to have two major domains²². The first one comprises the space operations. China’s space programme was under the General Armament Department (GAD) prior to the latest reforms. Though China’s officially stated policy is non-militarisation of space, the very fact that its space programme

21. T. Shaohui, “China Inaugurates PLA Rocket Force As Military Reform Deepens”, January 1, 2016, http://news.xinhuanet.com/english/2016-01/01/c_134970564.htm

22. “PLA Strategic Support Force”, *Sino Defence*, January 1, 2017. Available at: <https://sinodefence.com/organisation/pla-strategic-support-force/>. Accessed on January 17, 2017.

PLA SSF will be controlled centrally by the CMC. It will have its units and corresponding command and control staff in each of the Theatre Commands. The organisation at the Theatre Command level is likely to have a dual command and control system as the PLA Navy and Air Force had in the *avataar* prior to the reforms.

was under the GAD implied that there is a significant military content in it. From 10 satellites at the turn of the century, China's satellite constellation has increased to 181 satellites²³ and the number is constantly growing. China's satellites include weather observation, earth observation, environmental monitoring, remote sensing and navigation satellites. In addition, it is pursuing a space station project called *Tian Gong*, a moon programme called *Chang'e* and a manned spacecraft programme called *Shen Zhou*. In August 2016, China launched a Quantum

satellite. As per *Xinhua*, "The (Quantum) satellite is designed to establish ultra-secure quantum communications by transmitting uncrackable keys from space to the ground".²⁴ Some analysts also attribute teleportation capability to this satellite.²⁵ In October 2016, China launched a micro-satellite named *Banxing 2* from its space station *Tian Gong 2*.²⁶ Earlier there were reports that a Chinese micro-satellite had passed a mere 45 km from the International Space Station.²⁷ All this indicates that China's space capabilities are good and improving further. This capability will now be under the PLA SSF.

23. *UCS Satellite Database*, August 11, 2016, available at http://www.ucsusa.org/node/3354%26gt%3B%3B#.WQr6p_mGPIU.

24. Available at http://news.xinhuanet.com/english/2016-08/18/c_135611520.htm. Accessed on January 14, 2017.

25. P. S. Singer, Jeffery Lin and P. Costello, "China's Quantum Satellite Could Change Cryptography Forever", *Popular Science*, March 3, 2016.

26. "Companion Satellite Released from Tiangong-2 Space Lab for Orbital Photo Shoot", *Spaceflight101.com*, October 23, 2016.

27. Kevin Pollpeter, Joan Johnson-Freese, Dean Cheng, "China's Space & Counter Space Programmes", Testimony before the US - China Economic and Security Review Commission, February 18, 2015. Available at https://www.uscc.gov/sites/default/files/Annual_Report/Chapters/Chapter%202%2C%20Section%202%20-%20China%27s%20Space%20and%20Counterspace%20Programs.pdf

The second important capability that is likely to pass into the hands of the PLA SSF is the Information Warfare (IW) capability. Under this domain, the PLA SSF is likely to have the psychological operations, offensive and defensive cyber operations and electronic warfare capabilities²⁸. The Chinese PLA is one of the few armies relying heavily on psychological operations and has invested heavily in cyber warfare. Each Military Area Command had a cyber unit. These are likely to be reorganised and affiliated to the Theatre Commands. It is a known fact that China has civilian entities incorporated for the cyber warfare task.²⁹

China was by far the largest source of international hacking attacks, with 41 percent of the world's attacks to its credit.³⁰ China watchers will also recall that the Cyber Unit 61398 was located in Shanghai in 2013. Its cyber warfare capabilities have been experienced by many countries, including advanced countries like the USA. Needless to say that India has also been one of the victims of cyber attacks from China. There is a huge radar network that it has built up all along the coastal areas and its borders with other countries. All these capabilities will also now be under the PLA SSF. A diagrammatic organisation of the PLA SSF is given in Fig 6 below:

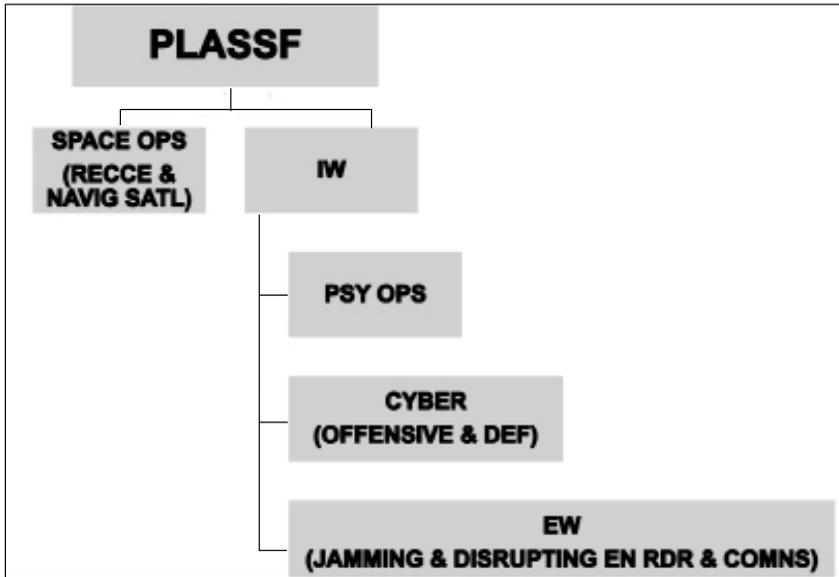
The second important capability that is likely to pass into the hands of the PLA SSF is the Information Warfare (IW) capability. Under this domain, the PLA SSF is likely to have the psychological operations, offensive and defensive cyber operations and electronic warfare capabilities.

28. Lincoln Davidson, "China's Strategic Support Force: The New Home of the PLA's Cyber Operations", *Council on Foreign Relations Net Politics*, January 20, 2016 Available at <http://blogs.cfr.org/cyber/2016/01/20/chinas-strategic-support-force-the-new-home-of-the-plas-cyber-operations/>. Accessed on March 14, 2017.

29. William Howlett, *The Rise of China's Hacking Culture: Defining Chinese Hackers* (San Bernardino: California State University, 2016), p. 22.

30. N. Staff, "Top 10 Countries Where Cyber Attacks Originate", *Government Technology*, April 24, 2013, Available at <http://www.govtech.com/security/204318661.html>. Accessed on March 14, 2017.

Fig 6: Expected Organisation of PLA SSF



Human Resources for PLA SSF

In order to constitute this force, manpower has been drawn from the PLA's No 1 Department (Operations), No 2 Department (Intelligence), No 3 Department (Technical Reconnaissance), No 4 Department (Electronic Counter-Measures and Radar) and Informationisation Department (which is also sometimes known as the No 5 Department). From the departments from which manpower has been drawn to create the PLA SSF, one can clearly understand the role and mission of this force.³¹

Mission of PLA SSF

The mission of the PLA SSF is to enable battlefield operations in the aerospace, space, cyber and electromagnetic battlefields. In the space domain, this will involve, target tracking and reconnaissance, operation of the Beidou navigational satellites (23 satellites out of the planned 35 satellite constellation have been launched so far), and management of reconnaissance satellites. In the cyber space, it will involve both offensive and defensive cyber operations. Jamming and disrupting the enemy's

31. n. 22.

radars and communications and protecting China's radars and communications from the enemy's attacks through Electronic Counter-Measures (ECMs) will also be the mission of the PLA SSF. Another major mission that has been given to the PLA SSF is to protect China's financial security and the security of the people's lives.³² This mission enables the PLA SSF to support China's interests at home and abroad. It is in consonance with this that the role and mission enunciated for China's armed forces in its 2015 White Paper, that go beyond China's territory.

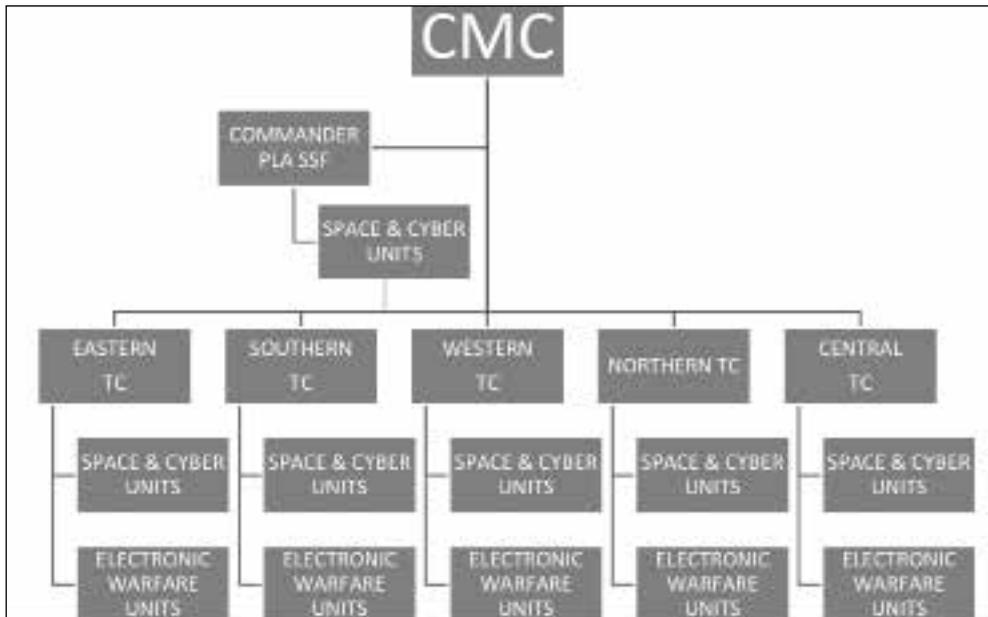
Troops equipped with outdated equipment, administrative staff and non-combatant personnel are expected to be reduced. This will release funds for modernisation of forces. A report of March 11, 2017, said that the reserves in the PLA will be reduced and the reserves in the other Services will be increased.

Command and Control

The PLA SSF will be controlled centrally by the CMC. It will have its units and corresponding command and control staff in each of the Theatre Commands. The organisation at the Theatre Command level is likely to have a dual command and control system as the PLA Navy and Air Force had in the *avtaar* prior to the reforms. While they will be placed under the Theatre Command, for technical control, they will be under the CMC. The CMC will also be responsible for manning and equipping the PLA SSF. This system will enable the Theatre Commands to benefit from the capabilities of the PLA SSF without directly getting involved in equipping and training the units. The CMC is likely to take care of the equipping, training and capability building of this force. A diagrammatic representation of the expected command and control of the PLA SSF is given at Fig 7.

32. S. Narasimha, "People's Liberation Army's Strategic Support Force (PLA SSF)", *Defence Aviation Post*, December 12, 2017. Available at <http://defenceaviationpost.com/peoples-liberation-armys-strategic-support-force-pla-ssf-the-game-changer/>. Accessed on March 14, 2017.

Fig 7: Organisation of PLA SSF in Theatre Commands



In these reforms, the higher level units of the PLA SSF have been placed under the CMC, thereby, enabling the PLA under the Theatre Commands to concentrate on operations. The CMC will directly supervise the sensitive space and cyber domains. The capabilities of space, cyber and electronic warfare can be exploited better by all the Services of the armed forces of China. Earlier, since these were under the General Staff Department and General Armament Department, there were drawbacks in sharing the inputs with the other Services. This force will enable better jointness amongst the Services. Though it is not a full-fledged Service, it will draw its importance from being directly under the CMC and the kind of capabilities that it is expected to possess.

PLA Rocket Force

In the present round of military reforms, the Second Artillery Force was upgraded from a branch to a Service equivalent to China's army, navy and air force. Xi Jinping described the PLA Rocket Force (PLA RF) as a "core of strategic deterrence, a buttress to the country's position as a major

power, and an important aspect of national security.” He made this statement when he visited the headquarters of the force in Beijing on September 26, 2016. The PLA RF has both conventional and strategic missiles. When the latest military reforms were announced, the question arose as to whether the conventional missiles would get delegated to the theatre commanders. It is, by and large, sure now that the PLA RF will be centrally controlled by the CMC.³³ The reason for this could well be that when a missile is launched, it is extremely difficult to make out whether it is a conventional one or a nuclear tipped strategic one. Should a theatre commander prematurely decide to launch a missile, it may result in an escalation of the conflict that could spin out of control.

As per the latest US Department of Defence report on China’s military capabilities, released in May 2016, China’s missile holdings are as follows:

Table 1

System	Number of Missiles	Launchers	Estimated Range(Km)
ICBM	75 - 100	50 - 75	5,400 – 13,000+
MRBM	200 - 300	100 - 125	1,500+
SRBM	1000 - 1200	250 - 300	300 - 1,000
GLCM	200 - 300	40 - 55	1,500+

ICBM – Inter-Continental Ballistic Missiles; MRBM – Medium Range Ballistic Missiles; SRBM – Short Range Ballistic Missiles; and, GLCM – Ground Launched Cruise Missiles.

Other than upgradation to a Service, no major change is expected in the capabilities of the PLA RF.

33. “Xi’s China: Command and Control”, *Financial Times*, July 26, 2016.

One of the major efforts by the PLA SSF is likely to be cyber warfare. India needs to synergise her efforts in this field. Separate domains need to be created for offensive and defensive cyber warfare. She also needs separate set of people to carry out offensive cyber operations. There are a number of agencies involved in cyber operations. Their efforts need to be synergised.

Reduction of Troops

In September 2015, Xi Jinping announced a reduction of 300,000 troops from the PLA by the end of 2017. This will bring down the strength of the PLA from 2.3 million to 2 million. The troops equipped with outdated equipment, administrative staff and non-combatant personnel are expected to be reduced. This will release funds for the modernisation of the forces. A report of March 11, 2017, said that the reserves in the PLA will be reduced and the reserves in the other Services will be increased.³⁴ The reduction in the troops levels is likely to create disturbances in the society. The provincial Party chiefs have been entrusted with the task of rehabilitating them.

However, there have been protests in Beijing by ex-Servicemen who retired prior to the reforms and who have not been rehabilitated.³⁵ The PLA personnel who will be retrenched due to the reforms by the end of 2017, will add to the problem. As it is, the official unemployment figure in China is 4.3 percent. The unofficial figure is around 10 percent.

INFERENCES

The present round of military reforms in the PLA is likely to radically change the way the PLA operates. A number of inferences can be drawn from these reforms. The PLA ground forces were the most powerful and they dominated the military scene in China. With these reforms, the power and influence of the ground forces will be reduced considerably. The chief of general staff will lose oversight of military training, and education, mobilisation, strategic planning, electronic warfare, cyber units, and human resources management. Human resources management will be

34. G. Dominguez, "China to Reduce Army Reserve Numbers" *HIS Janes 360*, March 13, 2017.

35. Xin Lin, "Chinese Military Veterans Gather in Beijing to Protest 'Broken Promises'", *Tuidang*, January 3, 2017. Available at <http://en.tuidang.org/news/communist-regime/2017/01/chinese-military-veterans-gather-in-beijing-to-protest-broken-promises.html>

done by the Political Works Department. The CMC will get involved in the day-to-day functioning of the armed forces. This aspect is likely to adversely affect the functioning of the CMC. Earlier, the CMC had a buffer which it could use effectively to do strategic thinking and planning. After the reforms, the PLA will concentrate more on operational issues related to combat and territorial defence. Separating the departments to form the PLA SSF will enable greater exploitation of the resources by all the Services. This will facilitate in increasing the joint operation capabilities. Overall, the PLA is likely to emerge as a leaner and meaner force, better equipped to carry out joint operations.

IMPLICATIONS FOR INDIA

India needs to increase its deterrence capability to warn China not to enter into a conflict due to the enhanced capabilities that it may achieve as a result of the reforms. Creation of the PLA SSF and increased testing of missiles by China in the recent past will enable it to launch protracted non-contact warfare. The non-contact phase of operations will aim to degrade the Indian armed forces' ability to fight a war effectively. This phase will mainly be focussed on space-based operations and cyber warfare. Since these domains do not have territorial limitations and activities in these fields have absolute deniability, they cannot be deemed to be acts of war in the true sense. China follows the principle of active defence. The principle of active defence implies that China will not necessarily wait for an adversary to launch an attack on its soil. It can take proactive measures to preempt its adversary's attack. The PLA SSF will be central to this concept and will provide an information umbrella to its armed forces. This will reduce the Observe, Orient, Decide and Act (OODA) loop and also reduce the time for the PLA to react to any adversary's actions. India needs to prepare itself for such an eventuality. India also needs to improve its space and information warfare capabilities. The PLA RF will be able to offset the disadvantage that the PLA Air Force faces due to the high altitude terrain in the Tibetan plateau. Therefore, India needs to cater for redundancies in its operational and civil infrastructure. To counter the PLA RF, India needs to continue on the development path and attain an effective ballistic missile defence capability.

India needs to monitor the PLA SSF's space assets and develop systems to safeguard own assets. Since this force has all the space and cyber assets of China placed under it, India needs to harden, isolate, and protect its critical infrastructure and military networks. India also needs to synergise its offensive and defensive cyber capability. There has been talk of China developing laser and particle beam weapons that the Chinese call the assassin's mace weapons. These are likely to be launched from space and likely to be part of the PLA SSF. Therefore, India needs to protect its networks and harden them against such weapons. One of the major efforts by the PLA SSF is likely to be cyber warfare. India needs to synergise its efforts in this field. Separate domains need to be created for offensive and defensive cyber warfare. It also needs a separate set of people to carry out offensive cyber operations. A number of agencies is involved in cyber operations and their efforts need to be synergised.

China follows the concept of three wars. These are psychological, media (public opinion) and legal wars. Of these, psychological warfare is likely to be part of the PLA SSF. In India, there has been no effort that can be seen in the open source domain regarding psychological operations. There is also a belief that psychological operations are undertaken only during a war. This is misleading. Psychological operations need to be carried out in a continuum. India needs to create a structure at the national level to do this and thereafter incorporate all the agencies that are needed into it.

CONCLUSION

China has embarked on a long-term plan to modernise its forces. The roots of these reforms go back to the era of Hu Jintao. There will be a quantum change in the way China's armed forces operate in the future. India needs to analyse these reforms in detail and take action quickly to be prepared to face any action that China may take against it in the future. Asymmetric warfare is likely to gain increasing prominence and importance in China and building its capabilities. The implications for India mentioned above need to be studied in detail and an action plan needs to be worked out to build own asymmetric capabilities.

AEROSPACE POWER AND FOREIGN POLICY: GLOBAL AND INDIAN SCENARIOS

SC MUKUL

For good or for ill, air mastery is today the supreme expression of military power, and fleets and armies, however, vital and important, must accept a subordinate rank.

—Winston Churchill

INTRODUCTION

Powerful nations radiate powerful influence far across their geographical borders over countries and continents through their foreign policies. And this influence, in other words, power projection, is mostly coercive, often disregarding the opinions of a majority of sovereign nations. President Bush, during the build-up for the Operation Desert Storm offensive, was brazenly explicit in conveying his threat even to friendly countries when he said, "If you are not with us, you are against us." The world has watched in recent decades how a couple of powerful nations have not felt deterred from launching punitive operations against unfriendly regimes. The ongoing conflicts in West Asia and Central Asia are glaring examples of this reality.

Air Marshal **SC Mukul** PVSM AVSM VM VSM (Retd) was commissioned into the fighter stream of the IAF in January 1972. After a variety of field and staff appointments, he retired from HQ IDS in December 2010.

The final element of national power—the use of military tools for power projection—is aptly defined by Carl Von Clausewitz as “a true political instrument, a continuation of political intercourse, carried on with other means.”

Much as the weaker nations might despise such arrogance of the mighty nations, the latter have been succeeding in enforcing their plans, even if partially, in different parts of the world.¹

Classically defined, the foreign policy of a country is the product of both geography and history and is impacted by global, regional and internal developments. It is the tool by which a country interacts with the world outside its borders. It is designed to promote national interest, security and development, namely, protection of a country’s national sovereignty and territorial integrity; and promotion of the well-being of its

people.² It provides the context within which we can examine the existence and utility of the military as an instrument of foreign policy.

POWER PROJECTION

The ability of a nation to apply all or some of its elements of national power—political, economic, informational, or military—to pursue its foreign policy objectives in the international arena is a measure of its power projection. The final element of national power—the use of military tools for power projection—is aptly defined by Carl Von Clausewitz as “a true political instrument, a continuation of political intercourse, carried on with other means.”

Military assets, depending on how they are employed, can advance a state’s foreign policy goals by facilitating the projection of both hard or soft forms of military power based on the political goals being sought and the level of force employed,³ as given below:

1. Col Karan Kharb (Retd), “State of Military Might in Resurgent India” Vivekananda International Foundation, August 25, 2014, Available at <http://www.vifindia.org/article/2014/august/25/state-of-military-might-in-resurgent-india>
2. http://www.idsai.in/idsacomments/TasksbeforeIndianForeignPolicy_ArvindGupta_090512
3. Walter C Ladwig III, “India and Military Power Projection”, *Asian Survey*, vol. 50, no. 6, December 2010, pp. 1162–1183.

- Four of these goals relate to the employment of “soft” military power (securing sea lanes of communication, non-combatant evacuation operations, humanitarian relief, and peace-keeping); and
- Five other goals are primarily concerned with “hard” military power (showing the flag, compellence / deterrence, punishment, armed intervention, and conquest).

Traditionally, during ancient and medieval times, it was the land forces which were predominant as a tool of power projection. As the world horizon expanded, it was sea power which ruled the world. It

was only a century ago that air power became a factor of any consequence in warfare, and by extension, became available to statesmen. In fact, the ascent and success of air power as a tool of power projection over the last century have flowed primarily from the fact that public and senior civilians in the government of the time realised the value of air power, understanding it to be a uniquely new approach to success in conflict. The growth of air power since then and its dramatic effect on the fate of nations in the international arena can be gauged by the fact that air power has been, during and since World War II, the final arbiter of military campaigns, including campaigns fought largely over the seas, and has succeeded sea power as the ideal instrument for a nation to project power, i.e. to become its voice in the international dialogue of power politics in both peace and in war.

With the advent of nuclear weapons, air power became the centre-piece of power projection in the form of strategic bombers till other forms of delivery caught up after a couple of decades. The launching of the Sputnik-1 on October 4, 1957, by the Soviet Union, as a low orbit artificial earth satellite

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Aerospace power has increasingly become the favourite choice for the politicians for enforcing foreign policy imperatives as it enables a nation to convey its will in times of need by its reach, mobility, flexibility and quick response. It has the inherent capability to escalate and de-escalate a situation quickly, with an ability to influence the environment in almost the entire spectrum of conflict.

opened up the space arena. It shattered the concept of the sovereignty of a nation on its air space or territorial waters, and sparked a spurt in the Cold War scenario, engulfing the space domain in its ambit. Today, with the gradual transition to aerospace power, these capabilities provide us communications, position-fixing, navigation, and missile-warning, as well as weather and reconnaissance facilities. The future will see growing dependence on space for facilities which have a crucial impact, as much on military operations as on economic and commercial activities globally.

AEROSPACE POWER

Aerospace power can be defined as “the ability to use platforms operating in or passing through the air and space medium for military purpose”, or “the ability to project military force in the air or space by or from a platform or missile operating above the surface of the earth”. Air platforms are defined as any aircraft, helicopter or unmanned air vehicle. Or simply put, it is “the ability to project power from the air and space to influence the behaviour of people or the course of events.”⁴

The tactical or strategic debate on employment of air power is often misplaced, as air power’s true strength lies in its marvellous versatility. Some of the undisputed attributes of aerospace power are that it encompasses forces drawn from all three Services and is inherently joint in nature. It is influenced by, and, in turn, influences, the land, sea and space environments. Contrary to conventional wisdom, aerospace power cannot win wars, but no modern war can be won without it. Aerospace power has increasingly become the favourite choice for the politicians for

4. <http://en.wikipedia.org/wiki/Airpower>

enforcing foreign policy imperatives as it enables a nation to convey its will in times of need by its reach, mobility, flexibility and quick response. It has the inherent capability to escalate and de-escalate a situation quickly, with an ability to influence the environment in almost the entire spectrum of conflict.

Air power blossomed to its full form during World War II under four different scenarios with far-reaching implications:

- The first one which heralded the opening campaign of World War II, was the German concept of *Blitzkrieg* or lightning war. Fast moving armoured columns on the ground, supported by furious air assaults by the *Luftwaffe*, resulted in the swift conquest of half of Europe in a few months, and set the bar for future army-air cooperation.
- The second was the commencement of a new phase in 1940, of strategic bombing in the hope of breaking the enemy's will to fight and bringing the war to an early conclusion. While the bomber offensive certainly caused immense damage to life and property, and also to German morale, whether its impact was enough to shorten the war, remains a hotly debated issue.
- The third comprised the atomic bomb detonations over Hiroshima and Nagasaki in August 1945. Both bombs were delivered by B-29 bomber aircraft, and their destructive power was enough to result in instant capitulation by the Japanese. This heralded a terrifying new capability of air power, and ensured a place for the manned bomber in the armoury of nuclear powers for many decades to come.
- The fourth was the focus and expansion of air transportation. By August 1945, the Air Transportation Command (ATC) had a fleet of 3,700 aircraft operating an aerial network stretching 180,000 miles, reaching virtually everywhere in the world. These activities changed intercontinental air travel from a state of high-risk adventure to a matter of daily routine. At the peak of its operations, ATC aircraft crossed the Atlantic at an average rate of one every thirteen minutes. In the process, the time required to cover distances around the world shrank dramatically, from a matter of weeks to a few days or, within a theatre, to a few hours.

Less than two years after the end of the Vietnam War, Cambodia, Laos, and South Vietnam were Communist countries. Vietnam demonstrates both the limits of air power and the limits of a strategy dependent on it when trying to achieve conflicting political goals.

The war-time experience and modern equipment supported many significant airlift operations in the post-war years. The Berlin Airlift of 1948–49 involved both military and civil aircraft. In 1952, the Civil Reserve Aircraft Fleet (CRAF) became a legal entity. The programme committed funds of several million dollars to ensure that reinforced floors, and cargo decks were built into a specified number of commercial aircraft that would be on call for the air force. During the Gulf War of 1990–91, some 150 CRAF aircraft served military operations, delivering as much as 25 percent of the air cargo and 60 percent of personnel arriving by air.

After World War II, the Vietnam War constituted a watershed for deployment of air power as a tool of a nation's foreign policy, especially in a limited war. In a decade and a half of slowly escalating conflict, the US lost over 8,500 aircraft and helicopters, inflicting its longest sustained "strategic bombing" campaign, wherein it dropped more than eight million tonnes of bombs in nine years. Smart weapons were tried out for the first time. However, less than two years after the end of the Vietnam War, Cambodia, Laos, and South Vietnam were Communist countries. Vietnam demonstrated both the limits of air power and the limits of a strategy dependent on it when trying to achieve conflicting political goals.⁵

It would be difficult to dispute that the application of American air power has had profound effects on the formulation and realisation of American military and political goals.⁶ The advent of precise, all-weather air effects was demonstrated convincingly in the 1991 and 2003 Gulf Wars and appeared

5. Mark Clodfelter, "The Limits of Airpower or the Limits of Strategy: The Air Wars in Vietnam and Their Legacies", *Joint Force Quarterly*, 78, July 1, 2015.

6. Ryan Kuhns, "Judging from Afar: Airpower & American Foreign Policy", March 15, 2015, <https://expattmagazine.wordpress.com/2015/03/15/judging-from-afar-airpower-and-american-foreign-policy/>

to offer a new and attractive alternative to the traditional, land-centric approaches to warfare that had previously dominated military strategy. The prospect of quick and easy victories at very little cost seemed to be a reality, created by the technological superiority of the USA and its allies in the air. However, the long and painful entanglements in counter-insurgency operations in Iraq and Afghanistan that subsequently followed, relegated air capabilities to a supporting role; air mobility and intelligence, surveillance and reconnaissance were the priorities, and the kinetic use of air power was largely confined to close air support or non-decisive, protracted attrition of a decentralised enemy's fielded forces.⁷

The September 11, 2001, attack on the Twin Towers in New York represents the most successful use of strategic bombing in history, wherein air power was aimed at the civilian population and morale in an enemy country. A single morning's air campaign provoked an air war that has yet to end. Almost 15 years later, American bombs and missiles are now landing on targets in not one, but seven largely Muslim countries (Afghanistan, Iraq, Libya, Pakistan, Somalia, Syria, and Yemen)⁸.

Through information dominance, aerospace power is about to set a new benchmark wherein it will be possible to find, fix, track and target anything that moves on the surface of the earth. Real-time cockpit information, directed-energy weapons, space-manoeuvring vehicles, space-based radars, and extensive applications of bio and nano-technologies are all just round the corner.

INDIAN EXPERIENCE

On the eve of India's founding, no one could have imagined how successfully it would come to navigate the international system. Many believed that the half-life of this new country would be measured in years, perhaps decades at most. The question of when India would split apart was one of the staples of public discussion going back to Churchill's celebrated remark, "India is a geographical term. It is no more a united

7. Air Commodore Alistair Byford, book review of John Andreas Olsen, ed., *Airpower Reborn: The Strategic Concepts of John Warden and John Boyd* (Naval Institute Press, April 30, 2015).

8. Tom Engelhardt, "Our Post September 11 Fifteen Years War", *Foreign Policy in Focus*, September 13, 2016, <http://fpif.org/post-september-11-fifteen-years-war/>

In fact, the national interest, role, goals and objectives of the armed forces were not quantified. In spite of professing peace and the policy of non-utilisation of military force for power projection to achieve its foreign policy objectives since independence, the country has successfully utilised aerospace power's soft option on four occasions and its hard option on six occasions.

nation than the Equator.”⁹ In the words of noted journalist, Mr BG Verghese, “History was stood on its head in 1950 when India ordained that democracy, with the full panoply of Fundamental Rights would be the instrument and not the outcome of a social and economic revolution.”¹⁰ In one of the greatest feats of modern history, since then, India has built a cohesive nation despite incredible poverty and diversity, prompting Professor John Kenneth Galbraith, former US ambassador to India and a noted economist, to declare that “India is a functioning anarchy.”

The strategic priorities for the emerging India were, firstly, to ensure healthy economic growth. Secondly, it had to ensure that poverty was alleviated and eliminated. Finally, these two priorities had to be achieved through good and effective governance. And to achieve these objectives, the security doctrine spelt out peace with neighbours, limited war, if inevitable, and a ‘no first use’ nuclear doctrine.

INDIAN FOREIGN POLICY AND POWER PROJECTION

Ever since India gained independence in 1947, policy-making in the areas related to defence and foreign affairs has remained the purview of the Government of India. Nehru, all through his 17 years as the prime minister of India, remained the sole master and architect of India's defence and foreign policy. No bureaucrat or fellow politician could interfere in these two areas except Krishna Menon. Non-alignment was the strategic framework – for both foreign policy and defence. The concept of having a formulated

9. Ashley J. Tellis, *Between the Times: India's Predicaments and its Grand Strategy* (Carnegie Endowment for International Peace), December 3, 2012. Available at <http://carnegieendowment.org/2012/12/03/between-times-india-s-predicaments-and-its-grand-strategy-pub-50223>

10. B G Verghese, *First Draft* (Chennai: Tranquebar Press, 2010), p. 36.

national perspective of strategic thinking was fairly ambiguous.¹¹ In fact, the national interest, role, goals and objectives of the armed forces were not quantified. In spite of professing peace and the policy of non-utilisation of military force for power projection to achieve its foreign policy objectives since independence, the country has successfully utilised aerospace power's soft option on four occasions, and, hard option on six occasions.

After 1991, when it was freed from the compulsions of having to avoid competing alliances at all costs, India entered the second phase of its foreign policy evolution. Pursuing a variety of strategic partnerships with more than 30 different countries, India sought to expand specific forms of collaboration that would increase its power and accelerate its rise. The domestic economic reforms unleashed in the very year of the Soviet Union's collapse paved the way for consolidating India's path toward higher growth. From the abysmal 3.5 percent annual growth witnessed until the 1980s, the 1991 reforms accelerated the improving 5.5 percent growth rate to the 7 percent demonstrated since the new millennium.¹² Since then, India has clearly entered a more confident, assertive period in its foreign policy, especially with respect to military diplomacy. We have forged defence agreements with all of the major states of Southeast Asia, going back to the 1990s. Likewise, India has been the mainstay of security in Mauritius and Seychelles since the 1980s. Indian involvement in Central Asian security is also not new, and can be traced back to the days of Taliban rule in Afghanistan in the late 1990s.

Under the changed scenario, the Raksha Mantri's Op Directive to the armed forces, issued around year 2001, not only outlined India's redefined strategic frontiers, but also led to revision of the aerospace, maritime and army doctrines envisaging tasking for Out Of Area Contingencies (OOACs). India has increased the number of countries with which it has defence-specific agreements – from seven to 26 by the end of 2008. Bilateral and multilateral exercises are also an increasing feature of India's expanding defence relations as it seeks to acquire

11. Gautam Sen, *Indian Higher Education: Perception, Policies and Practices*, vol. 1, no. 1, June 2013.

12. Ashley J Tellis "India as a Leading Power", Carnegie Endowment for International Peace, April 4, 2016. Available at <http://carnegieendowment.org/2016/04/04/india-as-leading-power-pub-63185>

While Japan was formally invited to join the Malabar naval exercises as a permanent member, a formal, long-term defence agreement with Australia was inked. And for the first time, a trilateral India-Japan-Australia security dialogue was held in June 2015.

new technologies to transform its military from Cold War era weapons to 21st century capabilities through such opportunities. Regular bilateral exercises like 'Cope India' with the US, 'Indra-Dhanush' with the UK and 'Garuda' with the French—in progress since 2004—are examples of the changed scenario. One can clearly discern that India's interests have changed over the past decade or more, taking it from a position of non-alignment and non-commitment to having specific strategic interests leading it to a path of "poly-alignment."¹³

Since the change of guard at New Delhi in 2014, Indian foreign policy has been aggressively presenting India as a security provider, especially in its neighbourhood. Every time the prime minister has been in the extended neighbourhood, including Japan, South Korea and Vietnam, he has flown India's defence manufacturing flag, renewing or signing new defence cooperation agreements to institutionalise high-level political and bureaucratic interactions, military exercises, military exchanges, and training of personnel. While Japan was formally invited to join the Malabar naval exercises as a permanent member, a formal, long-term defence agreement with Australia was inked. And for the first time, a trilateral India-Japan-Australia security dialogue was held in June 2015. In addition, New Delhi is trying to put in place the coastal surveillance radar system involving Sri Lanka, the Maldives, Mauritius and Seychelles in the Indian Ocean Region (IOR). India is interested in building its own defence industry through collaboration in co-producing specific systems, as well as through the export of its own existing weapon systems. In this regard, India has repeated its interest in buying and possibly co-

13. Brian K. Hedrick, "India's Strategic Defense Transformation: Expanding Global Relationships Summary", November 2009, <http://www.StrategicStudiesInstitute.army.mil/>

producing Japan's Soryu submarine and US-2 amphibious aircraft¹⁴

Today, the contemporary definition of 'national security' has expanded beyond protection of borders. It includes socio-economic factors that influence the well-being of the nation and its diaspora in the extended neighbourhood. In a country as diverse as India, maintaining law and order as part of internal security is a great challenge wherein intermittent spurts of violence may require quick deployment/reallocation of forces within the country at a very short notice. Apart from the primary role, the armed forces will continue to play a crucial role during disaster management. For timely relief efforts in case of natural or

man-made disasters to mitigate the adverse effects of the calamity as also towards rehabilitation, the military machinery will have to keep itself always geared up.

In this respect, during the last decade, we have seen India executing complex humanitarian missions. Be it in the South Asian region post the 2004 tsunami or the recently conducted rescue of 4,000 odd people from Yemen, India continues to grow in power and capacity. With each passing year, the response is getting stronger and more effective. Today, India has emerged as an effective first responder, to be relied upon, in the region stretching all the way from the Gulf of Aden to the Strait of Malacca. Be it Yemen or now Nepal, its performance has not only boosted our foreign policy but India has marked itself into the reckoning as a rising power with the fastest growing economy that can no longer be ignored on the geopolitical stage.¹⁵ The synergy among India's political, diplomatic, intelligence and forces

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14. Kanti Bajpai, "Modi's Foreign Policy How's It Going", *Global Brief*, September 2, 2016. Available at <http://globalbrief.ca/blog/2016/09/02/modi%E2%80%99s-foreign-policy-%E2%80%93-how%E2%80%99s-it-going/>

15. Danvir Singh, "India's Prowess and Disaster Diplomacy", *Issue Net Edition*, April 29, 2015.

The Indian Air Force (IAF), one of the world's oldest continuously-functioning air forces, with roots going back to October 8, 1932, is the world's fourth-largest combat air arm, with a rich historical legacy.

during these rescue operations has, indeed, been refreshing.

Capability enhancement during the last three Five-Year Plans reflects this aspect, with the induction of power-projection platforms such as aircraft carriers, nuclear-powered submarines, long-range combat aircraft with mid-air refuelling capability and landing platform dock ships. Work is also at an advanced stage in development of intercontinental ballistic missiles with a strike range in excess of 5,000 km. As per noted defence analyst, Ashley Tellis, "India is slowly maturing into a conventional great power,"

AEROSPACE POWER: INDIAN EXPERIENCE

The Indian Air Force (IAF), one of the world's oldest continuously-functioning air forces, with roots going back to October 8, 1932, is the world's fourth-largest combat air arm, with a rich historical legacy. It had an excellent track record during World War II in the China-Burma-India (CBI) theatre, the Wars of 1947, 1965, 1971 and the Kargil Ops.

At the commencement of World War II, the IAF comprised a mere 14 officers and 146 airmen. However, during the war, it expanded rapidly to a point where it ended up flying some 16,000 combat sorties in the China-Burma-India theatre, mostly in support of British, Indian and American ground forces. During the fight against the Japanese in the Battle of Kohima, from April 4 to June 22, 1944, and the Battle of Imphal, the army was entirely reliant on supply by air until the road from Dimapur was cleared. By the end of the battle, the air mobility assets had flown 19,000 tonnes of supplies and 12,000 men into Kohima and Imphal, and ferried out 13,000 casualties and 43,000 non-combatants.

In order to open up a new front against the Japanese, President Roosevelt started supplying China through the Lido Road, joining northeast India to Kunming in China. Closure of the land route by the Japanese led to large scale air mobility operations commencing in April 1942 when the Allied

forces started flying the “Hump,” which continued until 1945. Operating from 13 primary bases in Assam and six in China, the air force’s assets grew to 722 aircraft and more than 84,000 personnel by 1945. During the final offensives against the Japanese, there was one transport aircraft taking off every three minutes, with the monthly cargo delivered to China reaching 44,000 tonnes —peaking at 71,000 tonnes in July 1945.¹⁶

In independent India’s first war, air power played a stellar role in the defence of Jammu and Kashmir (J&K). On October 27, 1947, three Dakotas of 12 Squadron airlifted the vanguard of 1 Sikh from Palam to Srinagar. In the next 11 days, the Dakotas had airlifted 3,500 troops. But for this timely airlift and the valiant actions of the IAF and the Indian Army, Srinagar would have been lost. Spectacular flying feats by Wing Commander Mehar Singh helped to shore up many precarious situations during the defence of Leh and Poonch.

Use of military power to achieve Indian foreign policy goals through the use of soft or hard forms of aerospace power since independence makes an interesting study. The salient events since independence are as under:

- Air action was seen during the liberation of Hyderabad during ‘Operation Polo’, lasting five days, in September 1948. Two squadrons of Tempest aircraft were tasked for air support from Pune. On September 2, 1948, based on aerial reconnaissance, well entrenched ambush positions set up along the way to Rajasur were engaged by the Tempests, clearing the route and allowing the land forces to reach and secure Rajasur by the afternoon. On Day 3, September 15, 1948, at the town of Surriapet, air strikes cleared most of the Nizam’s defences.¹⁷
- Due to the local political upheaval in Nepal, the Indian government arranged for the air rescue of King Tribhuvan of Nepal on November 10, 1951. Two Indian planes landed at Gauchar airport and flew back to New Delhi with the royal family. King Tribhuvan was formally welcomed by the Indian prime minister and other high officials. On February 18, 1952, King Tribhuvan returned from India as the monarch of Nepal.¹⁸

16. C. V. Glines, “In Pursuit of Pancho Villa,” *AIR FORCE Magazine*, February 1991.

17. https://en.wikipedia.org/wiki/Indian_annexation_of_Hyderabad

18. https://en.wikipedia.org/wiki/Tribhuvan_of_Nepal

Air power was used in the Mizo district of Nagaland to contain the rebellion by Laldenga on March 2, 1966. A 24-hour curfew was imposed in Aizawl on March 3, and reinforcements were sent for the 1st Assam Rifles (AR) by helicopters. Toofani fighters operating from Kumbhirgram, and Hunter fighters operating from Jorhat, undertook independent missions to escort the troop reinforcements and to suppress the insurgents.

- Under the UN flag, for the first time, an IAF squadron was tasked for operations in Congo on October 9, 1961. Operating a detachment of six Canberra aircraft, the squadron was given the area of responsibility over southern Katanga province, aligned with the Indian ground troops. Extensive air support was provided to stabilise peace in the area of responsibility under the UN mandate, in conjunction with the Indian Army contingent.¹⁹

- Next, air power was utilised during the liberation of Goa, Diu and Daman from the Portuguese occupation. Two air attacks conducted on December 18, 1961, on the Dabolim airport by Canberra aircraft resulted in

destruction of the runway. A third Indian raid was successfully carried out by Hunters, targeting the wireless station at Bambolim with rockets and guns.²⁰

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- Showing the flag by Mirages over Jaffna was accomplished on June 4, 1987, both as a show of force to the Sri Lankan government of symbolic support

19. http://indianairforce.nic.in/show_page.php?pg_id=160

20. https://en.wikipedia.org/wiki/Annexation_of_Goa

21. https://en.wikipedia.org/wiki/March_1966_Mizo_National_Front_uprising

for the Tamil rebels as well as an act to preserve Indian credibility among the country's Tamil population. This was precipitated by the failure of the naval mission in May 1987. The decision was made by the Indian government to carry out an airdrop of humanitarian supplies. The mission consisting of five An-32s, escorted by five Mirage 2000s, was mounted on the evening of June 4, 1987.²²

- It was the phenomenal mobility and fire power of IAF helicopters in Sri Lanka during the Indian Peace-Keeping Force (IPKF) operations that enabled the Indian Army to successfully accomplish its task.²³ During the 30-month operation, more than 70,000 sorties were flown by the IAF's transport and helicopter aircraft to and within Sri Lanka. During the 20 days bitter fighting period, while disarming the Liberation Tigers of Tamil Eelam (LTTE), more than 3,000 tactical transport and assault helicopter sorties were carried out, providing suppressive fire against the militants' strong points and to interdict coastal and clandestine riverine traffic.
- The armed intervention in Maldives through airlift of a para-brigade from Agra to Maldives on November 3, 1988, was the most apt example of execution of the hard option of power projection utilising air power in pursuit of foreign policy goals. President Gayoom asked India for help to subdue an armed revolt at around 0800 hrs. Within 17 hours, on November 3, 1988, the first IL-76, carrying lead elements of the para-brigade had landed at Hulule airport of Maldives – a distance of around 3,000 km.
- The IAF took part in peace-keeping duties in Somalia from October 1, 1993, to December 21, 1994, as part of the Indian contingent supporting UN operations. The third major contribution of the IAF under the UN flag was in Congo which lasted from July 13, 2003 to October 4, 2010. Indian armed helicopters and utility helicopters were based in the Congolese provinces of North Kivu and Ituri, clocking more than 18,000 sorties in the inhospitable terrain of the Democratic Republic of Congo. The fourth contribution was the Indian Aviation Contingent (IAC) with 6 Mi-17 helicopters operating under the United Nations Mission in

22. https://en.wikipedia.org/wiki/Operation_Poomalai

23. *Ibid.*

The IAF vision is that as the primary custodian of aerospace power, it has to contribute to the national security of a resurgent India. For the past decade, the force has been undergoing frantic modernisation as outlined in the approved LTIPP 2012-27, under implementation.

Sudan (UNMIS). The contingent was based at Kadugli airfield and was active from October 2005 to December 2010.²⁴

Today, the IAF is in the process of transformation with the aim of becoming an “aerospace power capable of conducting full-spectrum operations and extending its strategic reach from the Persian Gulf to the Strait of Malacca.” This incredible outreach can be judged by the recent evacuation of over 4,000 Indian nationals and 900 foreign citizens from the war ravaged Yemen without any casualty or injury. The first Non-combatant Evacuation Operation (NEO) of 176,000 Indians from Kuwait, undertaken in 1991 during the first Gulf War, has emerged as the biggest airlift in history. The rescue and relief operations during the tsunami of 2004 amply demonstrated our capability for a quick and sustained response in our neighbourhood. The IAF has been regularly airlifting mobile hospitals, engineer task forces with special equipment, specialised teams of the National Disaster Relief Force (NDRF), along with tonnes of relief material including blankets, tents, tonnes of food, paramedics, stretchers, and medicines.

The IAF vision is that as the primary custodian of aerospace power, it has to contribute to the national security of a resurgent India. For the past decade, the force has been undergoing frantic modernisation as outlined in the approved Long-Term Integrated Perspective Plan (LTIPP) 2012-27, under implementation, consisting of adding various strike fighters, 4th/5th generation supersonic interceptors, strategic heavy lift transports, medium tactical transports, light transport aircraft, heavy lift and medium-assault helicopters, basic trainers, surface-to-air missiles and an array of sophisticated weaponry, utilising force multipliers such as in-flight refuelling, Airborne Warning and Control System (AWACS), Unmanned Aerial Vehicles (UAVs), for reconnaissance, and

24. http://indianairforce.nic.in/show_page.php?pg_id=271

developing a military satellite in an attempt to make the Indian Air Force of global importance within the next 20 years.

The Indian Air Force has embarked on a well planned expansion drive, building up its air mobility capability from 2,000 tonnes to 5,000 tonnes by the middle of the 14th Five-Year Plan to protect the nation's security interests. The C-130s and C-17s are well entrenched in service. Of the total helicopter holdings of the IAF of around 400, nearly one-half consists of the Mi-8/Mi-17 variants, making India one of the world's largest Mi-8 and Mi-17 operators.

Of these, 150 + comprise the Mi-17 V5 variant, which fall under the armed helicopter category, with substantial firepower, sophisticated avionics and onboard navigation systems and the latest and more powerful engines than the earlier variants. These have onboard weather radar, state-of-the-art autopilot, are equipped with the latest generation night vision devices and, thus, are capable of undertaking all-weather, day-night operations in any kind of terrain. They can carry out an out of ground effect hover at elevations up to 6,000 m and represent a great enhancement in the medium-lift helicopter capability of the IAF. Induction of Chinooks, Dhruvs and Apaches will add further punch to India's helicopter fleet.²⁵

An integrated air command, control and communication system, linking the AWACS, aerostat balloon radars and low-level transportable radars, fighter aircraft and helicopters, reconnaissance and battlefield damage assessment UAVs along with the planned dedicated military satellites for providing a gap-free, comprehensive reconnaissance and air defence system, keeping in mind diverse needs such as communications, has been operationalised with the help of Bharat Sanchar Nigam Limited (BSNL) and Mahanagar Telephone Nigam Limited (MTNL) providing the full gamut

There is an urgent need to build up "air sense" and faith in own aerospace power in the minds of the higher leadership of the country for its effective utilisation in the pursuit of foreign policy goals, as is being done by other powerful nations the world over .

25. Gp Capt AK Sachdev, "Helicopter Fleet for the IAF", *Indian Defence Review*, vol. 28, issue 2, April-June 2013.

of telecom services, including basic and mobile telephony, broadband and internet services, leased lines, Multi-Purpose Label Switching-Virtual Private Networks (MPLS-VPN) and Very Small Aperture Terminal (VSAT) services. Work has begun on embedding a secure, exclusive pan-India Optical Fibre Cable (OFC) communication network laid over 60,000 km, providing connectivity for the army, air force and navy, and boosting cyber security.

With dedicated service specific satellites in the process of being launched, the Indian Space Research Organisation (ISRO) has been a great contributor in facilitating the growth of the aerospace power segment. Today, India has 33 satellites in orbit around the earth and one in the Martian orbit. These include 12 communications satellites, 7 navigation satellites, 10 earth observation satellites and 4 weather monitoring satellites with day, night and cloud cover surveillance capability, and Cartosat-2, at 0.65m resolution, with a one minute spot video.

TASK AHEAD....

Due to the lack of “air sense” and faith in own air power in the minds of the higher leadership of the country, air power was not utilised offensively during the 1962 war with China. Even today, a narrow view of air power as solely being a provider of support to land and naval forces and homeland air defence is prevalent, with the higher leadership of the country unaware of its fullest potential for achieving strategic effects independently in the pursuit of national goals. There is an urgent need to build up “air sense” and faith in own aerospace power in the minds of the higher leadership of the country for its effective utilisation in the pursuit of foreign policy goals, as is being done by other powerful nations the world over .

To achieve this aim, we need to dispel four widely propagated myths about aerospace power: firstly, that air power is only associated with offensive action; secondly, that it is always escalatory; thirdly, that it is most effective only in conventional warfare; and, lastly, that it seeks to influence the environment on its own, and operates in isolation. There is an urgent need to look beyond recent land-centric campaigns to the wider opportunities offered by modern air power. For too long, air warriors have been guilty of focussing on excellence in delivery rather than on the most imaginative and innovative applications of air

power to achieve the desired strategic outcomes. The challenge before us is to convince the higher leadership of the country that modern air power can offer political decision-makers more and better options, but only if the underlying strategy links the application of air power directly and coherently to the desired end-state, rather than limiting its employment to the battlefield. This calls for stimulating new thinking amongst air warriors that will be necessary to promote the aerospace power renaissance that is required if military force is to remain an effective and useful lever of power projection.²⁶

As India marches towards its rightful place amongst the nations of the world, it is an opportunity for us air warriors to enhance the role of aerospace power in the pursuit of our national interests and perform to expectations with flying colours whenever and wherever we are called upon to do so.

26. Olsen, n. 7.

UNMANNED AERIAL VEHICLES IN NATIONAL AIR SPACE

MANMOHAN BAHADUR

INTRODUCTION

The safety of humans and aviation assets is paramount in flying, with all else being secondary; if there is ever a conflict or ambiguity in the interpretation of a rule, the rule of thumb is, 'flight safety is of paramount importance', and all actions are to be tailored accordingly. Thus, the guiding principle in manned flight has been one of 'see and avoid,' other than when a flight plan has been filed under Instrument Flying Rules (IFR), during which the onus of supervisory control is with an air traffic agency. Unmanned Aircraft Systems (UAS) have brought in a new dimension for the implementation of the 'see and avoid' dictum, as they go against the most basic 'given' in air traffic management, of a pilot being in the cockpit to follow the maxim. All prevalent flying structures, rules, regulations, advisories, procedures, visual signals *et al* have been framed accordingly.

As has been the case with most cutting edge technology, the UAS was born as a pure military machine that was flown and used in restricted air space reserved only for the military. However, its use in the civil market was soon realised and roles for it proliferated, from photography to courier delivery and from crop spraying to inspection of electric transmission lines, requiring sharing of air space with the military. A need was felt,

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A need was felt, more than two decades ago, to regulate air space usage by UAVs through legislative and regulatory processes. Major work is being done in the United States where UAVs should have been transiting civil air space by end of 2015, as per a direction given to FAA under the FAA Modernisation and Reform Act of 2012 (P.L. 112-95).

more than two decades ago, to regulate air space usage by Unmanned Aerial Vehicles (UAVs) through legislative and regulatory processes. Major work is being done in the United States where UAVs should have been transiting civil air space by the end of 2015, as per a direction given to the Federal Aviation Administration (FAA) under the FAA Modernisation and Reform Act of 2012 (P.L. 112-95).¹ By an Act of Congress in 2003, FAA had been directed to include in its next generation air transportation system, "...a wide range of aircraft operations, including airlines, air taxis, helicopters, general aviation, and unmanned aerial vehicles."² This gave an impetus to the administrators to continue

working towards accepting UAVs in the US national air space. Clearance for using international air routes would be the next logical step and the International Civil Aviation Organisation (ICAO) is already at work for framing rules and Standard Operating Procedures (SOPs) to ensure the regulation of unmanned aerial traffic internationally. An ICAO meeting in January 2007 concluded that "... ICAO should serve as a focal point for global interoperability and harmonization, to develop a regulatory concept, to coordinate the development of UAS Standards and Recommended Practices (SARPs), to contribute to the development of technical specifications by other bodies, and to identify communication requirements for UAS activity."³

The introduction of armed UAVs and the rapid advancement of artificial intelligence has added a more intricate complexity to the requirement. In hot

1. Bart Elias, *Pilotless Drones: Background and Considerations for Congress regarding Unmanned Aircraft Operations in the National Airspace*, US Congressional Research Paper 2012, available at <http://fas.org/sgp/crs/natsec/R42718.pdf>. Accessed on February 22, 2017.

2. Ibid.

3. ICAO Cir 328, "Unmanned Aircraft Systems (UAS)", Order Number: CIR328, 2011, p. 1.

spots of the world, where conflict is taking place, both UAVs and armed UAVs are flying in the national air space in many countries, as well as crossing international boundaries on operational missions. However, this is happening within air space that is uncontested and where one side has total air control; it would not be wrong to say that the side using UAVs in such an environment is regulating the air traffic routing and procedures in such areas. Civil traffic is conspicuous by its absence in such places, and military aviation rules the roost, as it were. The Afghanistan-Pakistan border, Yemen, Somalia and the air space around Israel are examples where aerial military unmanned air operations are underway but air space conflict issues have not acquired any urgency to demand the creation of legislation and implementation of special rules. In the Western countries, however, civil drone flights have become worrisome and some initial rule-making has already taken place. For example, drones in Germany must not weigh more than 25 kg⁴, while in the UK, stringent rules and regulations have been laid down in a UK Civil Aviation Authority Manual CAP 722.⁵

This essay will, in two sections, deal with the issue of air space management and interoperability/joint operations matters. In the first section, air space management issues would be examined in three parts. Firstly, the existing air traffic services structure would be studied, especially the principles in force to ensure safe flow of traffic. Secondly, its adaptation to the introduction of UAVs would be derived; this would include the

4. US Library of Congress, "Regulation for Drones: Germany", Available at <https://www.loc.gov/law/help/regulation-of-drones/germany.php>. Accessed on February 19, 2017. .

5. UK Civil Aviation Authority, "Unmanned Aircraft Systems Operations in UK Airspace : Guidance", available at <http://publicapps.caa.co.uk/docs/33/CAP%20722%20Sixth%20Edition%20March%202015.pdf>. Accessed on February 19, 2017.

With an autonomous UAV, or the UCAV, there would be no pilot in the loop but possibly, a man *on* the loop – the difference between the two being that while in the former, a human is controlling operations, in the latter, the machine is carrying out pre-programmed as well as autonomous actions, and the human role is just supervisory in nature.

study for any modifications that may be required in the case of Unmanned Combat Aerial Vehicles (UCAVs). Lastly, organisational changes to implement the modifications that may be needed would be brought out. The discussions would then flow into the second section where additional important issues, other than those concerning air space, are debated. Though there are major differences between a UAV and an armed UAV (the armed UAV is an intermediate machine and could be likened to a benign transport aircraft platform that has been retrofitted with armament), these terms

would be used interchangeably to mean an unmanned aerial vehicle. In addition, the added complexities of UCAVs that affect their operations in the non-segregated air space would also be covered. This study takes as a truism that, in the foreseeable future, the Indian national air space would be predominantly a joint user air space, where military and civil, manned and unmanned, air operations would take place simultaneously; it would not be an either/or situation. Before moving to Section I, a few explanations would be in order.

If air space had been a total military asset all over the world, then the integration of UAS would not have been a problem, as a centralised military command post would have ensured separation. But in yesteryears, when a UAS was talked about, it carried the tag of ‘unmanned’ as there was no pilot in the cockpit; it was a remotely piloted aircraft, with a human being in control of the flight – the so-called Man in the Loop (MIL), and, hence, came the more technically correct term, Remotely Piloted Aircraft (RPA). With an autonomous UAV, or the UCAV, there would be no pilot in the loop but possibly, a man *on* the loop – the difference between the two being that while in the former, a human is controlling operations, in the latter, the

machine is carrying out pre-programmed as well as autonomous actions, and the human role is just supervisory in nature.

A little earlier, it was said that the challenge of safety regulators and operators is to 'see and avoid.' This is not wholly correct as the 'eyes' of the pilot only observe an event but it is the sensory impulse that is generated that enables him gain situational awareness of the environment around him to plan further action. Thus, if technology permits the operator of an aerial machine to have a 'sense' of the environment around him, then it is not necessary to replicate human vision in order to have accurate situational awareness. So the correct terminology to use is 'detect/sense and avoid' and this becomes an imperative Qualitative Requirement (QR) for UAS, so as to de-conflict with other aerial traffic.

SECTION I – AIR SPACE MANAGEMENT ISSUES

EXISTING AIR TRAFFIC MANAGEMENT STRUCTURE

The present Air Traffic Management (ATM) structure to manage and de-conflict air traffic is based on two types of control:

- **Procedural Control:** In procedural control, a defined volume of air space is delineated for a specified time to de-conflict air space users. If properly implemented, procedural control is simple to follow, as it is based on the go/no-go criteria, based on rules dependent on air defence identification procedures, types of available voice and digital communications between aircraft and air space control elements, control measures such as height bands dependent on aircraft types and restricted zones such as firing ranges and/or areas. An American Joint Services publication qualifies procedural control as a process which relies "...on common procedures, designated air space, and promulgated instructions by an air space control element to de-conflict and activate Air Traffic Control Measures (ATCMs), Air Space Control Measures (ACMs), Fire Support Coordination

“No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization by that State and in accordance with the terms of such authorization....”

Measures (FSCMs), and Air Defence Measures (ADMs).”⁶

- **Positive Control:** As the name suggests, this is a ‘hands-on’ control and relies on surveillance, accurate identification, and effective communications between air space control elements and air space users; in positive control, an air space user is told by an air traffic controlling authority exactly what to do and when. A lot of identification and surveillance equipment goes into effecting positive control to include radars, Identification, Friend or Foe (IFF) interrogators and receivers, beacons, tracking

computers, data links and communications equipment. There are two essential requisites for positive control, viz., capability to locate and identify air space users and ability to maintain continuous communication with them for dissemination of instructions. In a contingency of communication failure, positive control procedures have the capability to move to procedural control for continuation of safe flight.

ADAPTATIONS FOR UAS TO OPERATE IN NON-SEGREGATED AIR SPACE

The operations of UAS would have to adhere to the above two types of controls, as per existing laws and regulations. The in-force policy document for UAS operations is ICAO circular CIR 328 which states that as per Article 8 of the Convention on International Civil Aviation, signed at Chicago on December 7, 1944, and amended by the ICAO Assembly (Doc 7300), “No aircraft capable of being flown without a pilot shall be flown without a pilot over the territory of a contracting State without special authorization

6. US Joint Chiefs of Staff, Joint Airspace Control, Joint Publication 3-52, November 13, 2014, p I-5, http://www.dtic.mil/doctrine/new_pubs/jp3_52.pdf. Accessed July 20, 2015.

by that State and in accordance with the terms of such authorization....” Further, the circular quotes the Global Air Traffic Management Operational Concept (Doc 9854) which states, “An unmanned aerial vehicle is a pilotless aircraft, in the sense of Article 8 of the Convention on International Civil Aviation, which is flown without a pilot-in-command on-board and is either remotely and fully controlled from another place (ground, another aircraft, space) or programmed and fully autonomous.” This understanding of UAVs was endorsed by the 35th Session of the ICAO Assembly held in September-October 2004, and has not been amended since.

Since there had been a great demand, especially from commercial operators, to open up the air space to UAVs, ICAO clarified in unambiguous terms, “UAS will operate in accordance with ICAO standards *that exist for manned aircraft* (emphasis added) as well as any special and specific standards that address the operational, legal and safety differences between manned and unmanned aircraft operations. In order for UAS to integrate into non-segregated air space and at non-segregated aerodromes, *there shall be a pilot responsible for the UAS operation* (emphasis added). Pilots may utilize equipment such as an autopilot to assist in the performance of their duties.”⁷ Thus, it is abundantly clear that, as of the present, humankind is not willing to have an autonomous machine in the same air space as a manned one due to flight safety reasons. Only RPAs will be able to integrate into the international civil aviation system in the foreseeable future. The functions and responsibilities of the remote pilot, as also his own safety, are essential to the safe and predictable operation of the RPA while it (the RPA) interacts with other aircraft and the Air Traffic Management

Only RPAs will be able to integrate into the international civil aviation system in the foreseeable future. The functions and responsibilities of the remote pilot, as also his own safety, are essential to the safe and predictable operation of the RPA while it (the RPA) interacts with other aircraft and the Air Traffic Management (ATM) system.

7. n.3, p.7.

(ATM) system—this aspect is an important point in the decision-making loop (for authorising UAV operations in the non-segregated air space) and will be covered subsequently.⁸

To fly in a common user air space, a UAV / UCAV would need to have the following prerequisites:⁹

- Certification for the RPA, its operator and remote pilot. This necessitates laying down of internationally accepted rules, since in international transit, every country over which the unmanned aircraft is flying, would insist on adherence to its standards. It needs to be appreciated that this is a very stringent requirement since it is not just the certification of the machine that is being talked about, but the complete system of ground-based equipment (at origin, in transit and at destination), communication relays as also the competence of personnel who would service the system and fly the unmanned aircraft remotely.
- Approvals from competent national authorities to operate the RPAs as a complete system. Since the sourcing of the various systems and sub-systems would be different from one country to another, the system as a whole would need to be approved. Any changes of sub-systems having an impact on flight safety would require a re-verification.
- Equipment for interaction with Air Traffic Control (ATC) and other aircraft ('other' aircraft include UAVs and UCAVs). This implies that there would have to be a certain amount of standardisation so as to enable airborne equipment (of manned and unmanned objects) to communicate with each other and with ground-based equipment. This requirement would have to transcend operating personnel of different nationalities and equipment of different origins. The requirement thus takes the form of a global communication protocol agreed to by all concerned. With developments taking place at a fast pace in swarming techniques, additional and unique requirements would arise as foolproof communication would be necessary between the following.

8. *Ibid.*, p. 3.

9. *Ibid.*, p. 6.

- Ground control at place of launch (whether the pilot in the loop or the air traffic control) and the UAV and/or UAVs being controlled.
 - Other ground controls that would be involved in the transit of the UAV, including at the destination.
 - Airborne controller of the UAVs (whether the pilot of another aircraft as in a hybrid manned/unmanned formation, or a controller in an Airborne Warning and Control System (AWACS) or Airborne Early Warning (AEW) aircraft) with the UAVs or the swarm being controlled.
 - Integral swarm communications.
 - Communication between various airborne controllers whose UAVs/swarms may land up in a conflict situation.
- Fool-proof security for communication and data links. This is a requirement of the RPA, the remote pilot station and the operators themselves, and introduces an altogether different element, perhaps placing more stringent and elaborate security requirements than for manned aircraft operations. This aspect is covered in detail later.
 - Predictable actions, so that human operators know what to expect of an unmanned aircraft under a given set of inputs. In the case of a manned aircraft, acceptance of an order by a human recipient would result in a predictable action. A similar response would be expected of an RPA, and it would normally be so too since there is a man in the loop, albeit at a remote location from the unmanned vehicle. This requirement would seem to disqualify aUCAV totally, since it would be acting autonomously; this aspect is discussed subsequently.
 - Contingency procedures. As a general rule, contingency procedures demand predictable actions that are understandable and anticipated

Fool-proof security for communication and data links is a requirement of the RPA, the remote pilot station and the operators themselves, and introduces an altogether different element, perhaps placing more stringent and elaborate security requirements than for manned aircraft operations.

To identify and avoid bad weather is very important from the point of safety. Here, the RPA faces a limitation, as it would not be able to 'visually' report weather conditions around it, the way a pilot can, by observing, analysing and passing on his deductions to the air traffic control and other aircraft.

by all. In RPAs, the presence of a man in the loop would normally meet this requirement. Such may not be the case with UCAVs due their autonomous nature. Software solutions in the embedded artificial intelligence would need to be exhaustive to replicate the actions of the remote pilot (of a UAV if he was in the UCAV loop) in order to measure up to this requirement. "Air navigation service providers will need to review emergency and contingency procedures to take account of unique RPA failure modes such as C2 link failure, parachute emergency descents and flight termination."¹⁰

- Collision and hazard avoidance equipment and capability. Though all the points mentioned above are important, this one would be the final test for acceptance or rejection of a UAS. Since the whole aim of the evaluation process is to determine the ability of a UAS to safely transit an air space along with manned aircraft, the capability to sense/detect likely situations that may cause a collision with another airborne or ground-based object, in other words, to avoid getting into a hazardous situation, would be a capability that would be critically evaluated. This would involve, not only the equipment (both airborne and ground-based) but also the electronic reasoning and logic fed into the system.

Unless unique types of air spaces, with varying minimum requirements are promulgated, the above requirements, met in full, would be necessary to impart the following capabilities to an RPA.

- Recognise and understand aerodrome signs, markings and lighting, which would be mandatorily required for ground handling, pre and post a mission.

10. Ibid.

- Recognise visual signals, on the ground (e.g., for parking or other marshalling actions while manoeuvring on the ground) and in the air (e.g. during an interception);
- Identify and avoid terrain, when operating close to the ground, e.g., during take-off/landing operations in a hilly area [like Leh or the Advanced Landing Grounds (ALGs) in northeast India] or during pre-planned low flying.
- Identify and avoid bad weather, which is very important from the point of safety. Here, the RPA faces a limitation, as it would not be able to 'visually' report weather conditions around it, the way a pilot can, by observing, analysing and passing on his deductions to air traffic control and other aircraft. Similarly, reporting of weather to a remote pilot by the ATC would not be assimilated in a manner that a pilot in the cockpit would be able to do. In the majority of cases, the remote pilot would err heavily on the side of caution, resulting in probable sub-optimal execution of missions in less than ideal weather.
- Provide "visual" separation from other aircraft or vehicles. The detection would come about by using electronic sensors; and though the distance and positioning of the object in space would be available, the "sense" of the situation that a human brain would form would be difficult, if not downright impossible, to replicate electronically.
- Avoid collisions by taking required actions in a manner consistent with flight safety.

The above requirements place a heavy demand on engineers and industry to devise solutions for the critical requirement of 'detect and avoid'. It may well transpire that the solution could be to have transitional phases and have the air space opened up for UAS operations in a gradual manner over time, with relaxations of restrictions in tranches as technology progresses and matures

ICAO has accepted that integration of RPA into aerodrome operations will prove to be among the greatest challenges. As it states,

Since the present rules demand manoeuvring of the RPA through a remote pilot, a time latency factor in execution of orders and tasks comes into the equation; safety considerations will demand, at the very minimum, low latency so that safety is not compromised.

At issue are provisions for the remote pilot to identify, in real-time, the physical layout of the aerodrome and associated equipment such as aerodrome lighting and markings so as to manoeuvre the aircraft safely and correctly. RPA must be able to work within existing aerodrome parameters. Aerodrome standards should not be significantly changed, and the equipment developed for RPA must be able to comply with existing provisions to the greatest extent practicable. Moreover, where RPA are operated alongside manned aircraft, there needs to be harmonization in the provision of ATS. Consideration may be given to the creation of airports that would support RPA operations only.

Current provisions regarding aerodrome design, construction and operations would continue to apply, however, some amendments or additions may be necessary to accommodate unique RPA issues.¹¹

Technology will play a vital role in the ease of acceptance, or otherwise, of UAVs in the common user air space. Since the present rules demand manoeuvring of the RPA through a remote pilot, a time latency factor in execution of orders and tasks comes into the equation; safety considerations will demand, at the very minimum, low latency so that safety is not compromised. While normal operations would generally meet the criteria, it is the emergency manoeuvring to avoid collisions, or other flight safety situations, or to follow orders of air traffic control, that would constitute the deciding factor. The UAV would need to be an effective communication relay for the remote pilot, since the ATC would be observing the UAV and issuing orders to it (the UAV) for implementation, as it would to any other manned aircraft; the actions would have to be relayed to the remote pilot whose control inputs would then govern the RPA's behaviour—as brought out earlier, a very low latency time would be an imperative requirement.

11. Ibid.

Peculiarities: The unmanned aircraft presents a large number of peculiarities that need to be addressed by aviation administrators and operators. While many have been discussed earlier some more special issues that need to be factored in are now covered.

- Wake turbulence is an important flight safety issue and considering the varying sizes and weight categories of unmanned aircraft, special studies may need to be undertaken to address this point. Separation standards may have to be re-defined and, may be, the procedures too.
- Transportation of restricted cargo, i.e., carriage of armament on board an unmanned aircraft is a special case for both UAVs and UCAVs. Military unmanned aircraft would have ordnance in certain flights. Even manned aircraft sometimes carry such load when transiting through civil air routes—the difference is that there is a pilot on board to take decisions in case a situation that warrants their jettisoning arises. So, when an unmanned aircraft with armament traverses through the unsegregated air space, safe routes and/or corridors may have to be laid out, so that it can be jettisoned in an emergency to a safe area. Alternatively, other than in the case of war, carriage in normal transit may have to be forbidden and the armament transported by other means, putting a limitation on emergent operations. Presently, this has not created any problems as such flights have taken place in the segregated air space, ensured by the military air space control. However, ICAO CIR 328 clearly states, “Payload on RPA is not a factor considered within this document except as it pertains to dangerous goods. Likewise, any communications/data link requirements for the payload are not addressed herein.” This implies that a UAV/UCAV with armament would have to be considered as a special case and rules framed accordingly. Similarly, Command and Control (C2) links for the payload being carried would form a special case for consideration.

Diversions to non-military airfields not equipped to handle UAVs may be required due to a host of reasons like bad weather, aircraft emergency, etc. What happens then? Are all civil/military airfields

expected to be equipped to cater to such diversions? If not, flight plans of unmanned aircraft would have to be tailored accordingly, with attendant penalties. Sometimes, the diversion may be ordered by the state over which the unmanned aircraft is flying—this is a right given to all states by ICAO legislation. This brings in an element of compromise of secrecy vis-à-vis the technology of the unmanned aircraft and/or its payload. However, unless the rules are amended, flights of UCAVs in foreign air space are prohibited, as CIR 328 states, “Each contracting State undertakes to ensure that the flight of such aircraft without a pilot in regions open to civil aircraft shall be *so controlled* (emphasis added) as to obviate danger to civil aircraft”,¹² implying that an autonomous aerial vehicle of one nation cannot overfly another’s air space unless a remote pilot is in the loop.

- Licensing of operating personnel would be complex in the international operations of an unmanned aircraft as the aircraft would land in an airport with its licensed remote pilot or operator (in the case of a UCAV) not available to the airport authorities. There would be issues of licensing of ATC personnel too, as new requirements of handling an unmanned aircraft would have to be added.
- The civil operators, as also the military, would like to have a ‘file and fly’ approach in unmanned operations. This would have to be handled with care and must follow a sequential approach through risk assessment at periodic milestones, so as to ensure safe and seamless integration of operations in the joint user air space.

ORGANISATION REQUIRED

Every armed force in India that operates an air arm has a specialised branch that deals with aviation issues. Within this branch, there are many specialties that necessitate the existence of sub-branches like those dealing with air defence, offensive operations, transport and helicopter operations, air traffic services *et al.* Unmanned aircraft operations could be part of one

12. Ibid.

such sub-branch or there may be a stand-alone sub-branch dealing with unmanned aircraft operations. Be that as it may, UAV operations in the non-segregated air space would require close coordination with the Ministry of Civil Aviation (MoCA) for the formulation of rules and regulations, as also SOPs. Thus, a joint permanent body of the Ministry of Defence (MoD) and MoCA comprising members from the Services, Directorate General Civil of Aviation (DGCA) and Airports Authority of India would need to be established to act as a nodal point for all issues concerning the use of the national air space by military and civil UAS; these would include, but not be limited to, air space management issues, conflict/dispute resolution, certification of UAVs, training of operators, and creation and maintenance of ground-based operational and administrative infrastructure. The body would be a hands-on entity that would be responsible for drafting rules and regulations, and monitoring their implementation by operators, both civil and military. There would be issues of confidentiality in some military UAS activities and missions; this body would accordingly be charged to ensure de-confliction without compromising the confidentiality of such missions. The responsibility for interaction with the ICAO UAS group and Eurocontrol would rest with this organisation.

A plan should be drawn up to cater to near, middle and long-term implementation of the induction schedule. To do this, studies and assessments would be required to be undertaken with respect to utilisation patterns, operational profiles and associated safety issues.

It is obvious that there would be a step-by-step expansion of the envelope of utilisation of UAS in the joint air space. It would be incumbent on the permanent UAS body to work up the steps and notify them for the information of the operators. A plan should be drawn up to cater to near, middle and long-term implementation of the induction schedule. To do this, studies and assessments would be required to be undertaken with respect to utilisation patterns, operational profiles and associated safety issues. There would be vast variation in each of these aspects. In the civil domain, tasks could vary from delivery of small courier packages to delivery of urgent

There would be a requirement to lay down the capability norms and minima as part of the airworthiness requirements so that equipment necessary to generate the required 'detect/sense and avoid' capability can be designed and manufactured to equip UAVs.

medicines and from crop spraying to traffic management/television coverage; in the military environment, the tasks could be as benign as inter-base transit to transit from a base to an armament range with live, loaded weapons. It should be remembered that an organisation's work culture also impacts the conduct of operations, hence, it is imperative that the rules and regulations that are made and promulgated, take this vital aspect into consideration. In aviation activity in a common area, there has to be only one culture, and implementation of orders and regulations cannot comprise an elastic interpretation by

different organisations. Thus, when aerial vehicles, operated by different and vastly varied agencies and of different shapes, sizes, capabilities and limitations transit a common air space, aviation safety demands creation of an aerial cloud where only one set of rules, agreed to, and accepted by, all the operators, is the norm.

It goes without saying that the governing rules and regulations should be drafted as early as possible, since manufacturers and operators have to tailor their processes accordingly. MoCA has made a beginning by issuing *draft* guidelines in April 2016¹³ for "Obtaining Unique Identification Number (UIN) and Operation of Civil Unmanned Aircraft System (UAS)." Comments on the draft were asked for from the general public by May 21, 2016. It is presumed that the deliberations are still ongoing, since finalised, approved rules have not yet been issued. There would be a requirement to lay down the capability norms and minima as part of the airworthiness requirements so that equipment necessary to generate the required 'detect/sense and avoid' capability can be designed and manufactured to equip UAVs. These

13. "Guidelines for Obtaining Unique Identification Number (UIN) & Operation of Civil Unmanned Aircraft System (UAS)", available at [http://www.dgca.nic.in/misc/draft%20circular/AT_Circular%20-%20Civil_UAS\(Draft%20April%202016\).pdf](http://www.dgca.nic.in/misc/draft%20circular/AT_Circular%20-%20Civil_UAS(Draft%20April%202016).pdf). Accessed on February 19, 2017.

are not part of the draft guidelines. Such equipment would be both ground and air-based and a technically qualified organisation to check certification would be needed. Besides the MoD and the civil aviation department, legal and commercial arms of the government would also need to be associated to address issues of liability and commerce. Where would the liability lie in the case of a UAV mishap that causes loss of life and /or property, whether on the ground or to an aerial vehicle, whether manned or unmanned? Would it be the equipment manufacturer or the operator who could be sitting hundreds of miles away, may be in a different country? In the case of a UCAV, it would be more complex as liability determination in the case of a 'wrong' decision by an artificial intelligence enabled machine would have many avenues to be addressed. There are, thus, many other issues like legal requirements, training, security and public relations that need to be looked into.

SECTION II

This section covers issues other than those having a direct bearing on joint utilisation of air space.

LEGISLATIVE REQUIREMENTS

The use of common air space by UAVs may be governed by regulations that are enablers to make full use of their capabilities. For example, a European Aviation Safety Agency (EASA) paper has recommended that regulations should not just be a carry forward of manned aircraft stipulations but be "...proportionate, progressive, risk-based, and the rules must express objectives that will be complemented by industry standards."¹⁴

Civil aviation in India is governed by the Indian Aircraft Act, 1934, when unmanned flying machines, other than balloons, were very limited and comprised those flown by radio control only; in fact, it is doubtful whether they were even available in India when the Act was formulated. Be that as it may, the Act defines an aircraft as:

14. Beth Stevenson, "EASA Proposes Proportionate Risk Scale for UAV Operation," Flightglobal.com, <http://www.flightglobal.com/news/articles/easa-proposes-proportionate-risk-scale-for-uav-operations-410145/?cmpid=NLC|FGFG|FGUAV-2015-0316-GLOBnews&sfid=70120000000taAj>. Accessed on February 15, 2017.

It would be appropriate that the implications of UCAVs, which would be a special category of UAVs, transiting the common air space, are dealt with separately. That they would be military machines, and would be flying due to a national requirement, implies that a special dispensation may have to be made with respect to immunity of the operators under certain circumstances.

‘Aircraft’ means any machine which can derive support in the atmosphere from reactions of the air (other than reactions of the air against the earth’s surface) and includes balloons, whether fixed or free, airships, kites, gliders and flying machines.¹⁵

So effectively, the present UAVs would be covered under the definition of ‘aircraft’ as given in the Act; however, considering the multifarious usages that the UAVs would be put to, it would be prudent that legal opinion on the sufficiency of the Act, as it exists today, is obtained. It would be appropriate that the implications of UCAVs, which would be a special category of UAVs, transiting the common air space

are dealt with separately. That they would be military machines, and would be flying due to a national requirement, implies that a special dispensation may have to be made with respect to immunity of the operators under certain circumstances. The criticality of UCAVs to the Indian military, as determined by the Parliament, should form the basis of the review of the Indian Aircraft Act.

SECURITY REQUIREMENTS

The security of aircraft and personnel takes on a different meaning when considering operations of unmanned aircraft in the unsegregated air space. With manned aircraft, anti-hijack security checks are carried out on passengers as well as aircrew; these checks are also done on all technicians, personnel (be they caterers, sanitation workers *et al*) and vehicles entering the sanitised area of an airport. Thus, an aircraft takes off from a sanitised area and with

15. The Aircraft Act 1934, available at <http://dgca.nic.in/rules/act-ind.htm> accessed on February 22, 2017.

security cleared people (passengers and crew) on board, thus, ensuring the aircraft's security from a hijack. In the case of UAVs, there are two ways by which security can be compromised. Firstly, by taking over of the machine by interfering with its data link mechanism (hacking, spoofing and other types of attacks), as is reported to have been done with a sophisticated RQ 170 American UAV by the Iranians on December 4, 2011 (the UAV was shown absolutely intact on Iranian television)¹⁶. This can be avoided by laying down stringent technical certification requirements which have adequate layers of hardware and software enabled security. The second way of hijacking a UAV is by holding a hostage or subverting the UAV operator. Thus, the physical security of a remote work station (including from a heavy weapons attack) and sanitisation of the remote workplace and personnel in it becomes a vital imperative. It

would have to be ensured that a rogue operator (of his own volition or under duress) does not wreak havoc in air space having both manned and unmanned aerial vehicles. This would also have to be guaranteed when UAVs on Beyond Line of Sight (BLOS) flights are handed over from one control station to another; the complexity in this would arise from the fact that the operators could be from two different organisations – in fact, they could be from different nations too for long range UAVs which would transit international routes. Thus, Indian rules would have to be in conformity with international operations to ensure standardisation. The empowered DGCA/MoD body would have to lay down rules and a mechanism to ensure this in a fool-proof manner.

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16. Frank Gardner, "Why Iran's Capture of US Drone will Shake CIA," available at [bbc.com, http://www.bbc.com/news/world-us-canada-16095823](http://www.bbc.com/news/world-us-canada-16095823). Accessed on February 22, 2017.

The public relations campaign can take the path of seminars, symposiums, public broadcast media like radio, television and print, as well as taking opinion makers through a detailed explanation of the safety factors built-in through simulation exercises.

TRAINING

Since there are varied types of unmanned aircraft (gradation depending on all-up weight, size and capability), it is a given that the training requirement of all the operators cannot be of the same rigour; however, certain baseline parameters have to be the same. In order to ensure standardisation, it may be necessary to establish a training institution. In the US, the FAA has selected the Mississippi State University to set up and operate a National Centre of Excellence under a public-private partnership programme.

The centre's research areas will initially include, among other things, search and avoid technology, control and communications and training and certification of the human resource.¹⁷ Considering the odds involved, a similar research set-up may be required to advise the MoCA/MoD team so that their deliberations and decisions remain contemporary and are based on the latest developments in the UAV field. For sure, there are major differences between military unmanned aircraft and those of the civil operators, but certain 'rules of the air' for unmanned operations in the non-segregated air space would have to be mandated. This may result in the loss of some operational 'bite' or flexibility but it is a loss that may have to be accepted for the sake of perception management of the public at large.

PUBLIC RELATIONS

The introduction of UAVs in the civil air space would raise many observations and fears amongst the public. Some are already being voiced and are genuine, for example, privacy concerns, but many may be exaggerated, especially those concerning security. It is essential that sensitisation of the public with salient aspects of joint usage of air

17. Juliet van Wageningen, "MSU to Lead Public Private UAS Airspace Integration Team," *Avionics Today*, http://www.aviationtoday.com/av/topstories/MSU-to-Lead-Public-Private-UAS-Airspace-Integration-Team_84992.html#.VVVF8jI6qqkp. Accessed on February 25, 2017.

space be commenced sufficiently before the start of these operations; this would ensure generation of a healthy debate on contentious issues and those that have a psychological effect on the public. This is an imperative that can be forgotten at the expense of credibility of the joint usage plan, and the target audience should not only include the lay public but also government officials and law makers. It needs to be remembered that an unmanned vehicle traversing the same air traffic service route as a passenger-carrying aircraft, would require a leap of faith on the part of the lay public; a pilot has been seen as the conduit of safe transit in aviation and, suddenly, his absence from the cockpit would require human emotions to be genuinely assuaged. The campaign can take the path of seminars, symposiums, public broadcast media like radio, television and print, as well as taking opinion makers through a detailed explanation of the safety factors built-in through simulation exercises.

SUMMATION

The demand for integration of RPAs into the non-segregated air space has commercial and political overtones that cannot be overlooked or delayed with an elastic timetable. What started as a demand to permit RPAs to transit in the US national air space has now become an international requirement being addressed by ICAO. It is apparent that India cannot remain oblivious to the necessity and, hence, structures need to be put in place to facilitate the induction of RPAs into the Indian air space.

The history of opening up of the national air space in India to joint user requirements (civil and military) has not been encouraging. After many decades of attempts, the burgeoning demand has finally resulted

As decreed by ICAO, there would be a requirement of a pilot in the loop and, hence, for the foreseeable future, true autonomous operations can be ruled out. However, a start needs to be made in India without any loss of time, for setting up a joint MoD-MoCA body to begin addressing the issue.

in an initial (and, perhaps, preliminary) document to transit to a process of opening up the military air space to civil traffic through a Manual of Flexible Use of Air Space (FUA) issued on August 28, 2014.¹⁸ Going by that experience, there would be many hurdles to cross when considering RPA operations in the non-segregated and flexible (civil and military) air space; it would be even more difficult when autonomous UCAVs are brought into the picture. As decreed by ICAO, there would be a requirement of *a pilot in the loop* and, hence, for the foreseeable future, true autonomous operations can be ruled out. However, a start needs to be made in India without any loss of time, for setting up a joint MoD-MoCA body to begin addressing the issue. The requirements are many, with the *main ones* summarised as under.

- There needs to be a pilot in the loop at all times when a UAV is flying. Hence, if a machine does not meet the requirements to be called an RPA, it would not be given access to unsegregated air space.
- All rules of the air for manned aircraft would apply to RPAs, in addition to special rules that may be made to co-habit a common air space.
- The RPAs would basically have to conform to the requirements laid down in ICAO CIR 328 and have the following prerequisites:
 - (a) Certification, for the RPA, its operator and the remote pilot(s).
 - (b) Statutory approvals from competent national authorities to operate the RPA as a complete system.
 - (c) Collision and hazard avoidance equipment.
 - (d) Equipment for interaction with ATC and other aircraft. This would include the various controllers (airborne or on the ground) that come into the equation when 'swarms' are using the common air space.
 - (e) Fool-proof security for the RPA, the remote pilot station(s) and the operators themselves. This is a requirement that would be more stringent and demanding than for current manned operations.
 - (f) Contingency procedures that would be unique to RPAs and may

18. Ministry of Civil Aviation, Government of India, August 28, 2014, "Manual of Flexible Use of Airspace in India," http://www.aai.aero/public_notices/FUA_Manual_V1_230315.pdf. Accessed on July 30, 2015.

demand actions from the operating environment that are different than those for a manned aircraft.

- (g) Technology that equips the RPA to operate and take actions that are 'predictable,' as would be expected from a manned aircraft.
- Technology would require the following qualities to be embedded in the RPA, with minimum time latency, subsequent to generation of a requirement for action to be taken.
 - (a) 'Recognition and understanding' of aerodrome indicators, lighting, etc.
 - (b) 'Recognition and understanding' of visual signals on the ground and in the air.
 - (c) 'Identification' and avoidance of terrain in flight close to the ground.
 - (d) 'Identification' and avoidance of bad weather, as well as a means of accepting and 'understanding' of weather reports transmitted by other agencies/aircraft.
 - (e) Ensuring 'visual' separation' from other traffic, as would a manned aircraft.
 - (f) Avoiding collision, on the ground and in the air, consistent with flight safety requirements.
- Rules for transportation of restricted cargo would need to be redrafted.
- Wake turbulence criteria and actions necessary would need modification.
- Legal requirements would need to be reworked to cater for peculiarities associated with RPA operations.
- Certain amount of commonality in the basic training for civil and military operators would need codification.

The idea of manned and unmanned vehicles flying together in the same air space is something that the public and government machinery (and that includes human beings), would need to be psychologically prepared for, through a public awareness programme. People need to be assured that the system supports safe 'joint' operations in the non-segregated air space.

INDIGENISATION OF UAVs BY INDIA AND ITS CHALLENGES

RK NARANG

The Indian armed forces were the first to acquire Unmanned Aerial Vehicles (UAVs) in India and their requirements have been predominantly met through imports. The Indian armed forces reportedly came out with a blueprint in early 2016 for the procurement of over 5,000 UAVs in the next 10 years, which is likely to cost US \$3 billion.¹ India's Research and Development (R&D) organisations have been trying to develop UAVs for its armed forces amid various limitations and challenges. However, they have not been able to develop many successful UAVs for the armed forces and civil industry, despite having a well-developed aviation R&D and production set-up. The civil UAV industry is at a nascent stage. The development of the UAV industry is closely linked to the indigenous aviation development and manufacturing capability. The aviation industry comprises both military and civil aviation industry. Indian R&D agencies have been involved in the development of military aircraft. However, there has not been adequate emphasis on indigenously developing civil aircraft and ground systems under the 'Make in India' campaign despite its having enormous economic benefits.

The Public Sector Undertakings (PSUs) and private sector companies involved in indigenous development of manned and unmanned aircraft

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1. Vivek Raghuvanshi, "India Finalizes \$3B Blueprint for UAV Fleets," March 20, 2016, <http://www.defensenews.com/story/defense/air-space/2016/03/20/india-finalizes-3b-blueprint-uav-fleets/81637026/>. Accessed on August 28, 2016.

The PSUs and private sector companies involved in indigenous development of manned and unmanned aircraft face enormous technological, regulatory and other challenges in India, which impede indigenisation.

face enormous technological, regulatory and other challenges in India, which impede indigenisation. Indian technical universities and colleges—a key component of the aviation eco-system—have not been adequately contributing in fundamental niche technologies in the aviation sector.

The persistent challenge for India has been to transform from being a net importer to an indigenous developer and exporter of aviation products, including UAVs. It is in this context that an understanding of UAV acquisition, development endeavours and the challenges

faced in indigenisation of both military and civil aircraft and UAVs becomes important. This paper would endeavour to address two key questions: firstly, what is the status of India’s UAV programme? And, secondly, what are the challenges being faced in the indigenisation of UAVs in India? It would also deliberate on the contribution of the PSUs, private sector entities, armed forces and academia in the indigenous development of UAVs in India.

INDIGENOUS UAV PROGRAMME

The UAV fleet of the Indian armed forces predominantly consists of the Searcher, Heron² and Harop UAVs³, which are imported from Israel. India’s indigenous UAVs are still in the development phase. India is a late entrant in the field of UAV development. Its indigenous target drone and UAV development programme is led by the Aeronautical Development Agency (ADA) of the Defence Research and Development Organisation (DRDO), which is primarily directed towards meeting the requirements of the Indian armed forces. India has developed target drones and micro and mini UAVs and is aspiring to develop

2. Dr Monika Chansoria, “Proliferated Drones: A Perspective on India,” <http://drones.cnas.org/reports/a-perspective-on-india/>. Accessed on July 25, 2016.
3. Tekendra Parmar, “Drones in India,” December 4, 2014, <http://dronecenter.bard.edu/drones-in-india/>. Accessed on August 1, 2016.

bigger and more capable Medium Altitude Long Endurance (MALE), High Altitude Long Endurance (HALE) and armed UAVs and Unmanned Combat Aerial Vehicles (UCAVs) indigenously. Its civil UAV industry is limited to a few individuals and companies, with a negligible presence in the Asian and global markets. The indigenous UAV development programmes are discussed below.

TARGET DRONES

Missile Target Ulka

The Ulka is an aircraft launched supersonic missile target developed by DRDO, which is powered by a solid booster rocket. It can operate up to an altitude of 9 km and has a range of 70 km.⁴

Lakshya Pilotless Target Aircraft (PTA)

The Lakshya is a high subsonic reusable tow target system developed by the Aeronautical Development Establishment (ADE) of DRDO and was inducted in the Indian Air Force (IAF) in 2000.⁵ It can carry two tow targets on wing mounted pylons, which trail the mother platform by 1.5 km. The Lakshya-2 is an advanced version of the Lakshya PTA, which can carry different payloads and has enhanced endurance.

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4. *Unmanned Aircraft Systems and Technologies*, vol. 18, no. 6, December 6, 2010, <http://www.drdo.gov.in/drdo/pub/techfocus/2010/dec10.pdf>. Accessed on August 10, 2016.

5. "UAV Lakshya Hits the Target," December 12, 2015, <http://www.newindianexpress.com/states/odisha/UAV-Lakshya-Hits-Target/2015/12/12/article3173665.ece>. Accessed on August 26, 2016.

Fig 1: Lakshya Pilotless Target Aircraft⁶



Abhyas High Speed Expendable Aerial Target (HEAT)

Abhyas, a low cost, high speed, expendable aerial target system has been developed by the ADE, a lab of the DRDO, to provide a realistic threat scenario for the practise of weapon systems. It is powered by a 25 kg thrust engine and has an endurance of 30-45 minutes. It is equipped with an Acoustic Miss Distance Indicator (AMDI) to indicate the miss distance.

6. n.4.

Fig 2: Abhyas Expendable Target Drone⁷



MICRO AERIAL VEHICLES (MAVS)

The Council of Scientific and Industrial Research of the National Aerospace Laboratories (CSIR-NAL), in collaboration with DRDO and the Department of Science and Technology of the Government of India, had set up the Micro Air Vehicle (MAV) Aerodynamic Research Tunnel at NAL in June 2015—the first of its kind in India—to test fixed wing, flapping wing and rotary wing MAVs in the 500 mm wingspan category as part of India’s National Programme on Micro Air Vehicles (NP-MICAV).⁸

7. “DRDO Abhyas High Speed Expendable Aerial Target (HEAT),” *Indian Armed Forces*, October 18, 2013, <http://aermech.in/drdo-abhyas-high-speed-expendable-aerial-target-heat-indian-armed-forces/>. Accessed on August 20, 2016

8. <http://pib.nic.in/newsite/PrintRelease.aspx?relid=122523>. Accessed on August 13, 2016.

They have developed the Black Kite, Golden Hawk and Pushpak MAVs and Indian Eagle (Imperial Eagle) and Slybird Mini UAVs.⁹

Fig 3: Golden Hawk Micro Aerial Vehicles¹⁰

DESIGN II - GOLDEN HAWK	
GEOMETRIC DETAILS	
Planform Shape	Cropped Delta
Span	300 mm
Area, S	0.06 m ²
Aspect Ratio, AR	1.5
Weight	245 g
Wing Loading (WIS)	40.05 N/m ²
AERODYNAMIC DATA	
Airfoil	SM-4308 Airfoil
Camber%	3.69%
CLOSS	1.26
Re	1,60,000
L/D (Lift to Drag Ratio)	9.7
PROTOTYPE FABRICATIONS	
Airframe	Foam and Balsa Wood

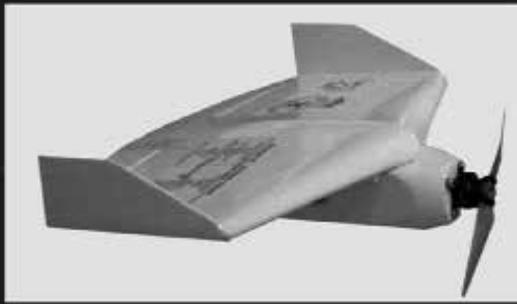
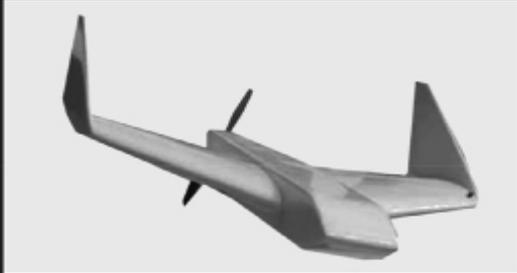


Fig 4: Pushpak Micro Aerial Vehicles¹¹

DESIGN III - PUSHPAK (PUSHER)	
GEOMETRIC DETAILS	
Planform Shape	Dihedral Delta
Span	300 mm
Area, S	0.556 m ²
Aspect Ratio, AR	1.59
Weight	270 g
Wing Loading (WIS)	46.696 N/m ²
AERODYNAMIC DATA	
Airfoil	Modified MH-49
Camber%	0.7%
CLOSS	1.05
Re	2,00,000
L/D (Lift to Drag Ratio)	7.7
PROTOTYPE FABRICATIONS	
Airframe	Foam & Balsa Wood



9. <http://www.nal.res.in/pdf/MAV.pdf>. Accessed on August 13, 2016.

10. "DRDO," http://www.drdo.gov.in/drdo/English/DRDO_BROCHURE_2015.pdf. Accessed on September 19, 2016.

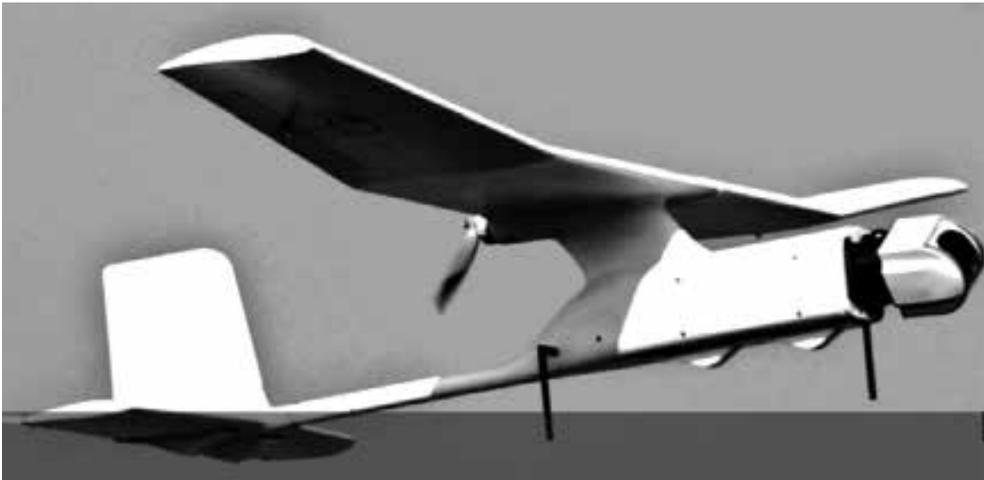
11. Ibid.

MINI UAVS

Indian Eagle and Sly Bird

The Indian Eagle (also known as the Imperial Eagle) and Sly Bird mini UAVs weighing around 2 kg and having an endurance of approximately one hour, were test flown at Bangalore in January 2012. These were developed to meet the short-range small UAV requirements of the Indian Army, Police and National Disaster Management Agency (NDMA).¹²

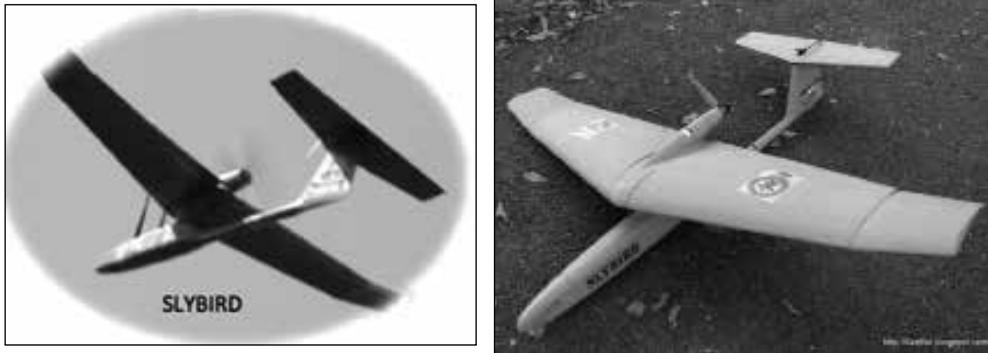
Fig 5: Indian Eagle, Mini Aerial Vehicle¹³



12. "Testing the Eye in the Sky," January 27, 2012, <http://www.thehindu.com/todays-paper/tp-national/tp-karnataka/testing-the-eye-in-the-sky/article2835797.ece>. Accessed on August 20, 2016.

13. <http://www.newindianexpress.com/states/karnataka/Desi-Air-Vehicles-Ready-for-Mass-Production/2014/09/30/article2455232.ece>. Accessed on August 13, 2016.

Fig 6: Slybird Mini UAV¹⁴



Netra Quadcopter

The police, paramilitary forces, NDMA and civil users in India are using the 'Netra', a quadcopter mini UAV, developed by DRDO.¹⁵

Fig 7: Netra UAV¹⁶



14. <http://www.nal.res.in/pdf/MAV.pdf>. Accessed on August 13, 2016.

15. <https://www.iitbombay.org/news/Current/dighi-defence-setup-to-lead-robotics-project>. Accessed on August 10, 2016.

16. <http://indiandefensereseach.blogspot.in/2012/01/india-current-future-uavs-ucavs.html>. Accessed on August 10, 2016.

TACTICAL UAVS

Nishant and Panchi

The Nishant is a vehicle mounted battlefield surveillance and reconnaissance UAV, which can be equipped with Electro-Optical/Infrared (EO/IR) payloads for target acquisition and tracking. It was launched in 1995 with an investment of Rs 90 crore. Four Nishant UAVs were supplied in 2013.¹⁷ However, there were apprehensions that the launcher of the Nishant UAV, which comprises a truck with a railing system, could give away its position to satellite or aircraft reconnaissance, compromising the safety of the UAV and its support systems during operations. Therefore, a wheeled version of the Nishant UAV, named Panchi, was developed, which was successfully tested in 2014.¹⁸ Also, the Panchi, being lighter in weight, would have carried greater payload than its predecessor, the Nishant. However, delivery of eight more Nishant UAVs was cancelled in November 2015.¹⁹

Fig 8: Nishant Tactical UAV²⁰



17. "After Crashes, Army set to Junk Nishant UAVs," November 20, 2015, <http://timesofindia.indiatimes.com/india/After-crashes-Army-set-to-junk-Nishant-UAVs/articleshow/49853186.cms>. Accessed on August 28, 2016.

18. Hemant Kumar Rout, "DRDO Conducts Maiden Test Flight of Panchi UAV," December 25, 2014, <http://www.newindianexpress.com/nation/DRDO-Conducts-Maiden-Test-Flight-of-Panchi-UAV/2014/12/25/article2587210.ece>. Accessed on August 10, 2016.

19. n. 20.

20. n. 12.

Fig 9: Panchi (Wheeled Version of Nishant) UAV²¹***Rustom-I***

The Rustom series of UAVs is being developed in three variants i.e. Rustom-I tactical UAV, Rustom-H MALE and Rustom-II armed UAV. The Rustom-I owes its existence to the initiative of the National Aerospace Laboratory (NAL)²² scientists. NAL has been involved in developing trainer and transport aircraft for civil aviation and micro UAVs. The Rustom-I UAV is named after the late Dr Rustom B Damania and is being developed by ADA of DRDO. Dr Rustom was a scientist at NAL, who had a passion for building aircraft and was the driving force behind many indigenous aircraft designs, including the Hansa-2²³ and Hansa-3²⁴ trainer aircraft²⁵ and Light Canard Research Aircraft (LCRA).²⁶

The Rustom-I is an all-composite UAV, which is based on the LCRA. It is powered by a single Lycoming engine and flew its first flight on October 16,

21. Ibid.

22. NAL comes under the Ministry of Science and Technology, India

23. Srinivas Bhogle, "Rustom Shouldn't Have Gone so Soon", October 3, 2012, <https://bademian.wordpress.com/2012/10/03/rustom-shouldnt-have-gone-so-soon/>. Accessed on October 15, 2016.

24. Hansa-3 became India's first indigenously designed all composite single engine propeller driven trainer aircraft, which was certified by DGCA in 2001.

25. Type Certificate, February 1, 2001, <http://dgca.nic.in/TC/Hansa-3.pdf>. Accessed on November 29, 2016.

26. Maneck Bhujwala, "India Drone Airplane Named After a Zarathushti Rustom," December 7, 2009, <http://www.parsinews.net/india-drone-airplane-named-after-a-zarathushti-rustom/862.html>. Accessed on October 15, 2016.

2010.²⁷ The Rustom-I has also served as a test-bed for various technologies to be incorporated in the larger and more capable Rustom-H and Rustom-II (armed) variants. India has made some progress in weaponisation of indigenous UAVs as the trials are being carried out to arm the Rustom-I MALE UAV with the HELINA Anti-Tank Guided Missile (ATGM). The Automatic Take-Off and Landing (ATOL) capability was indigenously developed and demonstrated on the Rustom-I in May 2015.²⁸ The ATOL capability will improve automation, enable UAVs to take off and land at night, and could remove the requirement of an external pilot.²⁹

India has made some progress in weaponisation of indigenous UAVs as the trials are being carried out to arm the Rustom-I MALE UAV with the HELINA Anti-Tank Guided Missile (ATGM).

Fig 10: Rustom-I



27. "A Long Flight of Unmanned Independence," p. 12, <https://www.joomag.com/magazine/sps-aviation-issue-8-2015-vol-17-issue-5/0197551001401100021?page=14>. Accessed on August 13, 2016.

28. Saurav Jha, "India is Finally looking to Enter the era of Armed Drones," May 23, 2015, <http://www.news18.com/blogs/india/saurav-jha/india-is-finally-looking-to-enter-the-era-of-armed-drones-10879-995842.html>. Accessed on August 13, 2016.

29. Ibid.

The Tactical Airborne Platform for Surveillance-Beyond Horizon-201 (TAPAS-BH 201), the first prototype of the RUSTOM – II, flew its first test flight on November 16, 2016, from the Aeronautical Test Range (ATR), Chitradurga, which is 250 km from Bangalore.

MALE/ HALE UAVS

Rustom-II

The Rustom-II MALE UAV being developed by DRDO is aimed at replacing the Heron UAVs.³⁰ Hindustan Aeronautical Limited (HAL) and Bharat Electronics Limited (BEL), with HAL being the prime integrator of parts built by BEL and other private players, would jointly produce the Rustom-II. The Defence Electronics Application Laboratory, Dehradun, has developed the data links, which comprise a critical part of the UAV.³¹ HAL, BEL and DRDO have jointly invested \$46 million in this. The third and fourth airframes of the Rustom-II, meant for the validation phase, are already undergoing trials. The fifth to eighth airframes to be offered for user evaluation had been ordered in 2015. The ninth to fifteenth airframes would be built from the production line some time in 2017-18.³² All the three Services have placed a consolidated demand for 75 Rustom-II UAVs.

The Tactical Airborne Platform for Surveillance-Beyond Horizon-201 (TAPAS-BH 201), the first prototype of the Rustom–II, flew its first test flight on November 16, 2016, from the Aeronautical Test Range (ATR),³³ Chitradurga, which is 250 km from Bangalore. The Rustom-II prototype was simultaneously tested by the Centre for Military Airworthiness and Certification (CEMILAC) and Directorate General of Aeronautical Quality Assurance (DGAQA), which are the designated organisations for

30. R Swaminathan, February 2015, http://www.orfonline.org/wp-content/uploads/2015/02/OccasionalPaper_58.pdf. Accessed on July 26, 2016.

31. Jha, n. 32.

32. Neelam Mathews, "India's Own MALE UAV To Fly Soon," November 5, 2015, <http://www.ainonline.com/aviation-news/defense/2015-11-05/indias-own-male-uav-fly-soon>, accessed on August 13, 2016.

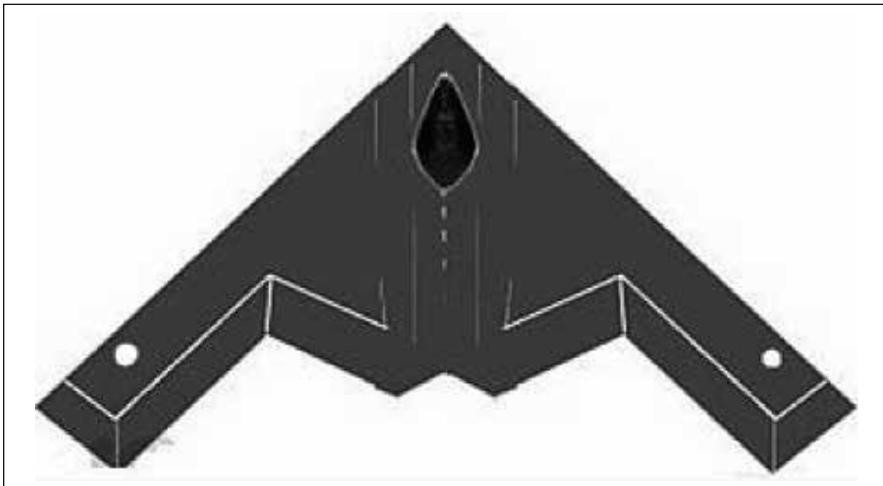
33. ATR is India's newly developed flight test range for the testing of UAVs and manned aircraft.

certification of military aircraft in India.³⁴ The Rustom-II was subjected to technology denials, which added to the delays in the project.³⁵

UCAVS: AURA AND USAV

The Indian Unmanned Strike Air Vehicle (USAV), which was earlier known as the Autonomous Unmanned Research Aircraft (AURA) would be a stealthy UCAV, which would carry weapons internally and be able to release Precision Guided Munitions (PGMs). It is likely to be powered by a jet engine without an afterburner, which could be a derivative of the indigenous Kaveri engine.³⁶ Its flight control system and data links will be designed by ADE and Defence Electronic Application Laboratory (DEAL), Dehradun.³⁷ The project has completed the concept evaluation stage and is being considered for design and development.

Fig 11: Artistic Impression of Aura/ Ghatak UCAV³⁸



34. "Successful Maiden Flight of Rustom-II," November 16, 2016, http://www.drdo.gov.in/drdo/English/dpi/press_release/rustamII_161116.pdf. Accessed on December 2, 2016.

35. Jha, n. 32.

36. Joseph Noronha, "A Long Flight to Unmanned Independence," *SP's Aviation*, no. 7, 2015, http://www.sps-aviation.com/story_issue.asp?Article=1437. Accessed on August 13, 2016.

37. n. 4.

38. Kalyannaidu000001 - Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=30991572>. Accessed on October 15, 2016.

The micro UAVs were ready for production by the end of 2014; however, HAL has not yet commenced commercial production of micro and mini UAVs.

This indicates the inability of the PSUs to convert indigenous designs into successful products.

NRUAV

The joint project between Hindustan Aeronautics Limited of India and Israel Aircraft Industries (IAI), Malat, of Israel to develop the Naval Rotary Unmanned Aerial Vehicle (NRUAV) for the Indian Navy was launched in 2008. However, the present status of this rotary wing UAV is unknown.³⁹

PRODUCTION OF UAVS

HAL has signed a Memorandum of Understanding (MoU) with ADE and NAL for mass production of micro, mini and MALE UAVs. It may be recalled that NAL has

designed micro and mini UAVs and is also involved in the development of the Rustom-I UAVs.⁴⁰ The micro UAVs were ready for production by the end of 2014; however, HAL has not yet commenced commercial production of micro and mini UAVs. This indicates the inability of the PSUs to convert indigenous designs into successful products.⁴¹

ENABLING TECHNOLOGIES

DRDO, in collaboration with the defence PSUs and private partners, has indigenously developed many enabling technologies in the process of development of UAVs and these include:

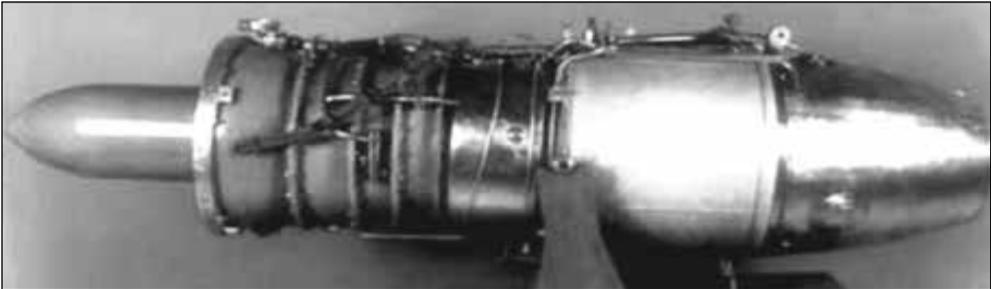
- Jet engine for the Lakshya PTA (PTAE-7).
- 55 HP Wankel engine for the Nishant UAV.
- Flight control software for UAVs.

39. PTI, "India, Israel Developing Unmanned Helicopter," April 2, 2008, <http://timesofindia.indiatimes.com/world/middle-east/India-Israel-developing-unmanned-helicopter-/articleshow/2918496.cms?referral=PM>. Accessed on August 10, 2016.

40. Furquan Moharkan, "Manning Unmanned Aerial Vehicles," May 30, 2016, <http://www.deccanherald.com/content/549359/manning-unmanned-aerial-vehicles.html>. Accessed on September 5, 2016.

41. Anantha Krishnan M, "Desi Mini UAVs Ready for Production," November 30, 2014, <http://icast.org.in/news/2014/sep14/sep30IEa.pdf>. Accessed on October 30, 2016.

Fig 19: Indigenous PTA Engine (PTAE-7)⁴²



- Software enabled capabilities, which include automated launch, manual and assisted take-off and landing,⁴³ auto-pilot functions, autonomous flight during data link loss, flying at low level under high G conditions, semi-autonomous and autonomous flight and return home capability.
- UAV simulator.

DRDO has developed the Global Positioning System (GPS) Aided Geo-Augmented Aerial Navigation System (GAGAN), which is a planned implementation of a regional Satellite-Based Augmentation System (SBAS) for navigation as well as for vertical guidance, and which will assist UAVs to land safely. It also launched the Geo-Synchronous Satellite-7 (GSAT-7), a dedicated military communication satellite for the Indian Navy, which can be used to control UAVs.⁴⁴

PUBLIC-PRIVATE PARTNERSHIP

The Research and Development Establishment (Engineers) (R&DE), a Pune-based lab of the DRDO, had collaborated with the Indian Institute of Technology (IIT), Mumbai, to develop the 1.5 kg 'Netra' quadcopter mini UAV.⁴⁵ The technology of the Netra was later transferred to the Mumbai-

42. n. 4.

43. <http://www.drdo.gov.in/drdo/pub/techfocus/2010/dec10.pdf>. Accessed on July 11, 2016.

44. Madhumathi D.S., "Indigenous Aero-Engine Stays on Radar, says DRDO Official," May 29, 2016, <http://www.thehindu.com/todays-paper/tp-national/indigenous-aero-engine-stays-on-radar-says-drdo-official/article8661571.ece>. Accessed on August 1, 2016.

45. <https://www.iitbombay.org/news/Current/dighi-defence-setup-to-lead-robotics-project>. Accessed on August 10, 2016.

based start-up Idea Forge⁴⁶, a company formed by four IIT, Mumbai (Powai), alumni, Rahul Singh, Ashish Bhat, Ankit Mehta and Vipul Joshi in 2012 for its production.⁴⁷

PRIVATE SECTOR INITIATIVES

India's private start-up companies like Garuda Robotics, Idea Forge, Airpix, Edall Systems and Aurora Integrated Systems have preliminary reach in UAV technology⁴⁸ and are dependent on foreign suppliers for semi-conductors, lithium polymer batteries, collision avoidance systems, engines, etc. Some of the Indian companies have come up with enabling technologies for UAV operations despite various challenges. A case in point is Zen Technologies Limited, a private company, which has indigenously developed simulators for UAVs.⁴⁹

CHALLENGES FOR INDIGENOUS UAV PROGRAMMES

India's indigenous R&D journey has been a roller coaster ride, with many promising starts and unexpected ends. Some of India's aviation indigenisation projects have shown tremendous promise in recent years. However, India has been unable to produce cutting edge aviation products despite having an extensive network of laboratories and research centres. Some of the constraints faced by the R&D agencies, PSUs and private sector entities are deliberated upon in the succeeding section.

46. Shashwat Gupta Ray, "UAV Netra Gets into Production," January 6, 2012, <http://www.sakaaltimes.com/NewsDetails.aspx?NewsId=5559164217083274887&SectionId=4924098573178130559&SectionName=Top%20Stories&NewsDate=20120106&NewsTitle=UAV%20Netra%20gets%20into%20production>. Accessed on August 28, 2016.

47. Sanjay Vijaykumar, "IdeaForge to Raise \$10m Series A Funding," December 23, 2015, <http://www.thehindu.com/news/cities/mumbai/business/ideaforge-to-raise-10m-series-a-funding/article8020460.ece>. Accessed on August 28, 2016.

48. n. 3.

49. VS Chandra Shekhar, Zen Technologies Limited, 11th International Conference on Energising Indian Aerospace Industry, September 5, 2016.

R&D Organisations and PSUs

DRDO, defence PSUs and other R&D agencies of India play an important role in the indigenisation of defence aviation technologies. They are often criticised for their failure to deliver, inefficiencies, lax work culture, and exceeding timelines and cost estimates despite having a huge infrastructure and substantial allocation of funds.⁵⁰ However, development of advanced aviation technologies, including UAVs, is an unknown area, venturing into which requires a high level of research, funding and government support. These entities often have to face bureaucratic difficulties for funding of their projects. The weaknesses, challenges, and opportunities for PSUs are discussed in the subsequent section.

India's private start-up companies like Garuda Robotics, Idea Forge, Airpix, Edall Systems and Aurora Integrated Systems have preliminary reach in UAV technology and are dependent on foreign suppliers for semi-conductors, lithium polymer batteries, collision avoidance systems, engines, etc. Some of the Indian companies have come up with enabling technologies for UAV operations despite various challenges.

Development Challenges

PSUs, in the past, either could not persist with successful aviation designs or were unable to increase the production rate due to various reasons. HAL has produced the Light Combat Aircraft (LCA) and Advanced Light Helicopter (ALH) successfully; however, it is still facing challenges in meeting the aspirations of customers, who demand regular improvements and upgradation of technology. The indigenously designed UAVs are also facing similar challenges and may not become successful products unless an enabling environment is provided. The challenges being faced by some of these newly designed UAVs are deliberated upon below.

50. Vipul Singh, Co-founder and CBDO of Aarav Unmanned Systems Pvt Ltd, in an email dated September 20, 2016.

HAL has produced the Light Combat Aircraft (LCA) and Advanced Light Helicopter (ALH) successfully; however, it is still facing challenges in meeting the aspirations of customers, who demand regular improvements and upgradation of technology.

Micro and Mini UAVs: The future of indigenous micro and mini UAVs is uncertain. The micro and mini aerial vehicles were ready for mass production in 2014⁵¹; however, HAL is yet to commence commercial production of micro and mini UAVs.

Nishant and Panchi Tactical UAVs: DRDO's Nishant UAV project, initiated for the Indian Army in 1995, was cancelled in 2015 after delivering four UAVs.⁵² The cancellation of the Nishant and Panchi tactical UAVs projects points towards the limitations of existing technologies, failure to upgrade them, and difficulties faced in developing enabling technologies in order to meet the aspirations of the users.

Rustom-I and II: The Rustom-I has a proven airframe and engine. It has carried out several test flights successfully, and integration of payloads, including weapons, is in progress. However, no firm orders have been placed for the Rustom-I. The Rustom-II, a truly indigenous design, had faced overweight challenges. The airframe weight of the Rustom-II, like most development projects, had increased from the estimated 1,700 kg to 2,400 kg (5,300 lb), which has impacted the planning and development calculations, and necessitated fitment of larger engines viz. Austro Engine AE300 diesels (rated at 170 Horse Power – HP). However, DRDO is aiming to reduce the All Up-Weight (AUW) after the delivery of the first 24 UAVs.⁵³

51. Krishnan M, n. 46.

52. <http://economictimes.indiatimes.com/news/defence/drdo-two-decade-old-nishant-uav-programme-crashes-indian-army-cancels-further-orders/articleshow/49809095.cms>. Accessed on July 12, 2016.

53. Mathews, n. 36.

Engine Development

The development of engines for its flying machines has been weak area for India. Lack of indigenous engines had resulted in the early decline of many promising indigenous aircraft designs, including the famous Hindustan Fighter-24 or HF-24 (Marut), which was designed in 1960 and was considered to be one of the best airframe designs of its era. The plan for indigenous development of engines has not achieved much success. Therefore, it is prudent to understand the engine development challenges in order to overcome past weaknesses.

Manohar Parrikar, the former Indian defence minister, unveiled a 25 kN engine built by HAL for its trainer aircraft at Bengaluru in late 2015. However, it may be recalled that HAL had developed a 25 kN engine for the upgraded version (Mk-II) of its trainer aircraft Kiran in the late 1970s. When development of the engine for the Kiran Mk-II was nearing completion, it was decided that the 30 kN Orpheus 703 engine of the HF-24 be de-rated to 25 kN for use on the Kiran Mk-II. Had India preserved its earlier 25 kN engine and upgraded it at regular intervals, we could have used this engine not only to upgrade our trainers but exported it to other countries. The redevelopment of the 25 kN engine in 2015 indicates the inability of India's R&D agencies to preserve indigenously developed technology.⁵⁴ India had initiated a programme for the development of the Kaveri jet engine for the indigenous LCA in collaboration with France. However, the project faced hurdles midway due to differences with the French partner. India is now planning to use the Kaveri engine without the afterburner for its Ghatak UCAV, which is in the development and testing phase.

India needs a wide variety of engines, including turboprop engines for its tactical and MALE class of UAVs. DRDO's Vehicles Research and Development Establishment (VRDE), has collaborated with Tech Mahindra to develop a 165-210 HP engine, which will power future Rustom UAVs. However, this too would be a new engine and its

54. Ajai Shukla, "Engine of Indigenisation", December 21, 2015, http://www.business-standard.com/article/opinion/ajai-shukla-engine-of-indigenisation-115122101122_1.html. Accessed on September 30, 2016.

When development of the engine for the Kiran Mk-II was nearing completion, it was decided that the 30kN Orpheus 703 engine of the HF-24 be de-rated to 25kN for use on the Kiran Mk-II. Had India preserved its earlier 25 kN engine and upgraded it at regular intervals, we could have used this engine not only to upgrade our trainers but exported it to other countries.

capability cannot be predicted at this stage.⁵⁵ India would have to develop efficient and more capable smaller engines for mini and micro UAVs. More of such indigenous endeavours are needed and successful designs preserved and upgraded regularly to reduce dependence on foreign suppliers and achieve a higher level of self-reliance in engine technology.

CONVERTING DESIGNS INTO PRODUCTS

The cancellation of the Nishant and Panchi tactical UAVs, lack of orders for the Rustom-I, and delay in the commencement of the commercial production of micro and mini UAVs indicates the challenges being faced in converting indigenously designed products into successful designs. The delay in the test flight of the Rustom-II UAV was due to design challenges and technology denials, which, in turn, could delay its commercial production and induction into the armed forces. Delays and failures are part of the indigenisation process. The inability of the R&D organisations and PSUs to convert an idea or design in the aviation domain into a successful product can be attributed to the following gaps:

- Lack of enabling technologies and facilities like engines, metallurgy, latest machines for design, testing equipment, laboratories, etc.
- Unavailability of the latest production processes, low production capacity, inadequate participation of the private sector, etc.
- Obsolescence of technology and failure to ensure timely product upgradation during its entire life span covering the development, production and operational utilisation phases, which can last several decades.

55. Jha, n.32.

Technology Development Vs Production

HAL, BEL and other PSUs appear to be having greater focus on production, which is attractive from the point of view of increasing their market share. The PSUs are following a two-pronged approach for increasing production:

- Increasing rate of production of indigenous products by involving the private sector; and
- Forming joint ventures with global aviation leaders for advanced technologies, which have not yet been developed in India.

There is a general perception that R&D laboratories and PSUs are resorting to acquisition of critical enabling technologies and sub-systems from domestic and foreign vendors and Original Equipment Manufacturers (OEMs) and assembling them, with only little technological development or technology gain. Such perceptions need to be nipped in the bud by DRDO and the PSUs by ensuring a transparent system of sharing information on the progress of various projects, especially those involving foreign OEMs.

Business Models

Aviation observers feel that products developed by the PSUs in India are sometimes incorrectly priced from the business and economic viability points of view. The method of costing of indigenous designs for transfer of technology to the private sector has been a weak area of the public sector R&D agencies. Sound and economically viable business models need to be worked out to ensure that they are able to generate revenue for the design as well as for the production agencies.⁵⁶

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56. Panel Discussion at 11th International Conference on Energising Indian Aerospace Industry: The Changing Environment” at New Delhi, on September 2, 2016.

Sound and economically viable business models need to be worked out to ensure that they are able to generate revenue for the design as well as for the production agencies.

Economy of Scale

Lack or uncertainty of orders for indigenously designed products from users results in lack of enthusiasm from the private sector to invest in procuring indigenously designed technologies. The numbers ordered by the Indian armed forces and Central Armed Police Forces (CAPFs) are normally small and based on their unique requirements, which adversely impacts the economic viability of the design and development projects. Most private sector entities are reluctant

to accept indigenous designs for production, which have no economic viability in the long run. The fewer numbers ordered by the users do not provide enough incentive to designers to continue upgrading such systems, and, as a result, such systems soon become obsolete. All these aspects need to be addressed if the indigenous aviation industry, especially the PSUs, have to compete at the global level.

Product Support

Some of the aviation platforms and systems designed indigenously by the Indian R&D agencies have struggled to become successful designs due to the inability of the production agencies to provide timely, assured and robust product support for the entire life cycle of the product.

PRIVATE SECTOR IN INDIGENISATION

Unrealistic Expectations

The aviation sector requires research and development of complex systems involving high investments. There is a growing perception that the private sector would be able to transform India's aviation sector and undertake all activities varying from core research to production of advanced aircraft and other weapon systems. However, this is a misconception as the private sector works on the economic models

and may not be able to sustain itself in the high-risk research and development programmes in the niche technology sector, which is full of uncertainties and prone to failures. Therefore, it may not be feasible for the private sector to undertake core research and development without reasonable certainty of success. However, the private sector thrives on its efficiency in production and applied research, which can be effectively utilised in increasing the production rate and in providing specialised systems and sub-systems to the integrators.

The numbers ordered by the Indian armed forces and Central Armed Police Forces (CAPFs) are normally small and based on their unique requirements, which adversely impacts the economic viability of the design and development projects. Most private sector entities are reluctant to accept indigenous designs for production, which have no economic viability in the long run.

CHALLENGES FOR MSMEs AND START-UPS

India has set up a Ministry of Micro, Small and Medium Enterprises (MSMEs)⁵⁷ considering the importance of these sectors. However, MSMEs and start-ups continue to face challenges with respect to their integration in the aviation eco-system. MSMEs contribute 45 percent of the industrial output and 40 percent of the total exports of India. They can play a significant role in the growth of the aerospace sector, including UAV development.⁵⁸ The start-ups ride on new ideas and their academic and professional excellence to provide innovative technological solutions in niche fields. They are, however, constrained by financial challenges and the absence of an enabling environment. They sometimes do not get clear and complete information regarding where they can contribute, the modalities for registration with aviation production organisations, and absence of a time limit for approval

57. "Ministry of Micro, Small and Medium Enterprises", <http://msme.gov.in/mob/home.aspx>. Accessed on September 4, 2016.

58. "Challenges to MSME", https://www.indiansmechamber.com/challenges_to_msme.php. Accessed on September 4, 2016.

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of registration of applications despite numerous initiatives by the government.⁵⁹

Financial Constraints

Start-ups and MSMEs often come up with innovative and unique designs and technological solutions, which can meet the requirements of the armed forces as well as provide them a technological edge. However, they are expected to pledge a certain minimum amount of capital to be eligible for supplying products to defence PSUs, which

they may not have. They also face difficulty in raising the working capital after winning the contracts. The MSMEs and start-ups need a variety of licences viz. Defence Industrial Licence, Explosives Handling Licence, UAV Licence, ISO Certification, etc. and need to possess expensive test equipment, storage facilities, etc. in order to meet the compliance criteria and be eligible for supplying their products to the armed forces and other government agencies. This makes the task of the MSMEs and start-ups extremely difficult and economically challenging.

R&D, IPR and Royalty

The innovative indigenous components, systems and sub-systems are developed by private sector companies while supporting R&D agencies like DRDO, NAL, etc. However, these designs are subsequently transferred by the R&D agencies to the PSUs for production. There is a feeling among the individual developers and private sector companies that the Intellectual Property Rights (IPRs) of the systems and sub-assemblies designed and developed by them are not adequately protected, as they do not get assured orders for production of those systems.⁶⁰ Also, they have to compete with others during the tendering process initiated by the

59. n.61.

60. Ibid.

production agencies, i.e. PSUs, despite having indigenised those products or sub-assemblies for the R&D agencies. They are sometimes coaxed to sell their rights to the PSUs, citing the limitations of regulatory policies.⁶¹

Certification and Acceptance of Innovative IDDM Products

Indian companies and individuals developing innovative and exclusive aerospace products and designs indigenously are unable to get certification if the demand for such products is either not raised by the armed forces or such products do not exist. This is due to non-availability of a designated agency

with the requisite technical expertise to assess Indigenously Designed, Developed and Manufactured (IDDM) as well as innovative products, evaluate the extent of indigenisation, and certify them. As a result, they are forced to sell their innovative designs and products to global aviation giants. A case in point is Verdant Telemetry and Antenna Systems Pvt Ltd, an Indian start-up founded by Louis George and Kuruvila George at Cochin in 1997,⁶² which supplies airborne and shipping antennae to leading aerospace and defence organisations. Its antennae are installed on the Searcher and Heron UAVs and C-130 transport aircraft, purchased by India. However, it initially struggled to sell its products in India.⁶³ Indian start-up companies feel that they are at a disadvantage vis-à-vis

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61. Vipul Singh, Co-founder and CBDO, Aarav Unmanned Systems Pvt. Ltd in email dated September 15, 2016.

62. "Management Team", http://www.verdanttelemetry.com/management_team.php. Accessed on October 16, 2016.

63. Interaction with Gowtham Hebbur Gurumurthy, Sr Technical Officer, Verdant Telemetry and Antenna Systems Pvt Ltd, 8th International Conference on Aerospace Industry: Challenges and Opportunities, India Habitat Centre, New Delhi, September 1-2, 2016.

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foreign suppliers for doing business in India.

Need to Review Defence Acquisition Plan

The MSMEs and start-ups feel that they are not able to adequately contribute in indigenisation as they do not benefit much from the existing 15-year Long-Term Perspective Plan of the Indian armed forces, which does not provide specific capabilities, technologies and products required in a finite period. They have been demanding formulation of annual and five-year acquisition plans by the defence forces. Formulation of annual and five-year acquisition plans would enable the MSMEs and start-ups to anticipate the requirements of the armed forces and align their development/ business plans with

them. This would enable them to contribute constructively and effectively in indigenisation.

Role of the Armed Forces

There is reluctance among the users to procure indigenously developed equipment, which is considered outdated and does not meet the requirements of the armed forces and security agencies. On the other hand, it is impossible to indigenously develop the best from the word go. The moot point is how to attempt indigenisation and, at the same time, meet the requirements of the armed forces and security agencies.

The Indian armed forces have vast experience in operating a wide variety of flying platforms, including UAVs. It has been seen among the leading military aircraft exporting countries that their armed forces play an important role during the design and development phase of the manned and unmanned flying machines. However, in India, most aviation projects are initiated by the

R&D agencies like DRDO, NAL and/ or HAL, and the armed forces are not involved during the conceptualisation or design stage. As a result, the R&D organisations are deprived of valuable inputs during the critical inception/ drawing stage.

ENHANCING THE SCOPE OF THE PROCUREMENT EXECUTIVE

The Dhirendra Singh Committee had recommended that the Procurement Organisation of the Ministry of Defence (MoD) be placed outside the Government of India (GoI) ministry structure to overcome existing limitations.⁶⁴ The mandate of the

proposed Procurement Executive outside the GoI ministry structure would be limited to procurements by the MoD. It would not have the mandate to synergise aviation and other acquisitions of the other ministries, CAPFs and agencies of the GoI. The procurement by various agencies within the country, if combined, could provide India with a huge leverage to seek transfer of technologies, manufacturing of equipment and/or shifting of assembly lines of equipment and sub-systems to India from the OEMs. Similarly, there is merit in integrating the civil and military aviation (including UAVs) industry under 'Make in India' as enhanced numbers for production and reduced cost could yield disproportionate economic benefits by becoming a major source of job creation, revenue generation through their export and, in turn, mitigate the military aviation products' development costs. Therefore, an independent common procurement agency, if established, would synergise the procurement of the products by the armed forces, ministries and other agencies in order to optimise the technological gains and reduce the cost of procurements.

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64. Para 6.6 of Report of Committee of Experts for Amendment to DPP 2013 including formulation of Policy Framework, July 2015, <http://www.mod.nic.in/writereaddata/Reportddp.pdf>. Accessed on January 2, 2017.

CIVIL AVIATION INDIGENISATION: THE UNEXPLORED POTENTIAL

The civil aviation sector has not been considered for 'Make in India' or indigenisation. The indigenous development of civil aviation aircraft and ground systems has enormous economic and technological potential with possible military applications, which has remained unexplored so far. India, with a size of \$16 billion, is the ninth largest civil aviation market in the world and is likely to become the world's third largest aviation market by 2020 and the largest by 2030.⁶⁵ India's civil aviation companies in both the public and private sectors, have placed orders or are likely to place huge orders for buying/ wet lease of passenger planes (about 850 aircraft), which include 100 jet planes by Spice Jet in a \$12 billion deal in 2016,⁶⁶ 250 aircraft by Air India, 100 aircraft by Vistara,⁶⁷ 75 aircraft by Jet Airways,⁶⁸ 250 aircraft by IndiGo,⁶⁹ 72 aircraft by GoAir, to name a few.⁷⁰ In addition to this, the Indian Air Force, CAPFs, some state governments and other private operators operate commercial civil aircraft. These are huge numbers and if the government provides a common platform to these airlines to integrate their requirements and acquisitions, India would be in a stronger position to bargain and acquire civil aviation manufacturing, Maintenance, Repair and Overhaul (MRO) and other technologies.

65. "India all set to Become the World's Third-Largest Aviation Market by 2020, says New Study," September 4, 2016, <http://scroll.in/article/805518/india-all-set-to-become-the-worlds-third-largest-aviation-market-by-2020-says-new-study>. Accessed on September 4, 2016.

66. "SpiceJet's 100-Plane and \$12 Billion Blockbuster Deal: Foreign Media," July 13, 2016, <http://www.ndtv.com/india-news/spicejets-100-plane-and-12-billion-blockbuster-deal-foreign-media-1430821>. Accessed on September 04, 2016.

67. PR Sanjai, "Airline Companies Seen Ordering New Aircraft on Sturdy Passenger Traffic Growth: Capa", June 3, 2016, <http://www.livemint.com/Industry/XUpiGZTKnIsbCK6w8zDKAM/Airline-companies-seen-ordering-new-aircraft-on-sturdy-passe.html>. Accessed on September 4, 2016.

68. Robert Wall, "Boeing Bags Order for 75 New 737s From India's Jet Airways," November 9, 2015, <http://www.wsj.com/articles/boeing-bags-order-for-75-new-737s-from-indias-jet-airways-1447054496>. Accessed on September 4, 2016.

69. Anurag Kotoky, "IndiGo Confirms \$27 Billion Order to Buy 250 Airbus Planes," August 17, 2015, <http://www.bloomberg.com/news/articles/2015-08-17/india-s-indigo-confirms-order-to-buy-250-airbus-a320-neo-planes-idfkj8wd>. Accessed on September 4, 2016.

70. "Budget Carrier GoAir to Purchase 72 A320neo Aircraft from Airbus," July 13, 2016, <http://economictimes.indiatimes.com/industry/transportation/airlines/-aviation/budget-carrier-goair-to-purchase-72-a320neo-aircraft-from-airbus/articleshow/53183199.cms>. Accessed on September 4, 2016.

India's endeavours in developing commercial civil aviation aircraft have not borne fruit so far. The high powered committee for National Civil Aircraft Development (NCAD), set up by the Council for Scientific and Industrial Research (CSIR) in May 2010, had recommended the launching of a civilian aircraft development project.⁷¹ Its past endeavours in developing civil passenger aircraft did not achieve the desired success. The civil trainer and transport aircraft designed by NAL, a laboratory under the Ministry of Science and Technology, did not succeed due to the inability to convert indigenous designs into commercially successful products.

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There is no known programme to indigenously develop civil aviation products like simulators, radars, landing and approach aids and other ground systems (for commercial users in the aviation sector) by the R&D laboratories in India. The indigenous development of such systems would help in reducing the cost of procurement, maintenance and operation of Indian civil airliners, with a possibility of technological benefits percolating down to military aviation. India lacks civil UAV manufacturing capability. Indian public sector R&D agencies do not have any known programme for indigenous development of civil UAVs.

ACADEMIA IN INDIGENISATION

According to the 2012 report of the Planning Commission Working Group on the Aerospace Sector, India, with over 380 universities, 11,200 colleges and 1,500 research institutions, has the second largest pool of scientists and engineers in the world.⁷² India lags behind in fundamental research due to

71. "Plan Panel to Allocate Rs 5,000 Crore to Develop Civilian Plane", January 22, 2012, <http://www.thehindu.com/news/national/plan-panel-to-allocate-rs-5000-crore-to-develop-civilian-plane/article2822788.ece>. Accessed on September 9, 2016.

72. "Report of the Planning Commission Working Group on Aerospace Sector", 2012, http://planningcommission.gov.in/aboutus/committee/wrkgrp12/wg_aerospace%20_sector.pdf. Accessed on September 3, 2016.

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inadequate investment in higher technical education. Despite having made reasonable progress in the economic field, India is still dependent on other manufacturers of the world for fundamental technologies varying from cars, computers, aviation, defence and other high technology industries. The low level of fundamental research can be gauged from the fact that most of the cars in India run on imported engines.

The engineers being trained in India are not given adequate practical training on the design, development and production aspects of the aerospace sector during their M Tech and PhD curricula. The engineering colleges do not possess an adequate state-of-the-art infrastructure and funding or a conducive environment to enable young engineers to innovate in the aviation sector at an early stage. They have to undergo practical training at aviation production factories and R&D agencies before they can contribute. The practical training cannot be imparted to engineers through the skilling programmes, which are aimed at training technicians. These engineers do very well when they study abroad, where they get practical training in colleges as well as by working with leading aerospace aviation giants like Boeing, Lockheed Martin, Airbus, etc. There is a need to provide the same environment to the students of leading IITs and engineering colleges within India.

ACADEMIA, PSUs AND PRIVATE SECTOR COLLABORATION

The involvement of academia in core aerospace research and development is limited due to the constraints of infrastructure, funding and absence of collaboration with R&D organisations of the government and the aviation industry. There is an increasing realisation among the PSUs and other R&D organisations of India that academic institutes can play a significant role in the development of innovative and cutting edge aerospace products. Secretary,

Department of Defence R&D and Director General DRDO, Dr S Christopher signed a Memorandum of Understanding with the Jadavpur University, Kolkata to establish the Jagdish Chandra Bose Centre for Advanced Technology (JCBCAT) to undertake research in cutting edge technologies in June 2016.⁷³ The Defence Institute of Advanced Technology (DIAT)⁷⁴ conducts M Tech and PhD courses on defence technologies for DRDO scientists, service officers, officers from defence industries and fresh engineering graduates⁷⁵. It complements the research and development efforts of the DRDO laboratories.⁷⁶ However, such collaborations are isolated their scope limited and they may not be able to bring transformational changes in the R&D culture unless a national level programme is launched to develop world-class technologies.

The lack of collaboration among the academic institutions, PSUs and aerospace industry can be better understood if we examine the way projects are undertaken in academic institutions. IIT, Bombay, and Birla Institute of Technology and Science (BITS), Pilani, carried out a study titled, "Design and Fabrications of Solar Powered Unmanned Aerial Vehicle" in July 2014 and

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73. "DRDO-Academia Partnership is Taking Shape in Kolkata", June 24, 2016, <http://timesofindia.indiatimes.com/good-governance/west-bengal/DRDO-academia-partnership-is-taking-shape-in-Kolkata/articleshow/52897474.cms?> Accessed on August 10, 2016.

74. An autonomous organisation under the Department of Defence Research and Development, Ministry of Defence, India.

75. Defence Institute of Advanced Technology, Pune, http://diat.ac.in/index.php?option=com_content&view=article&id=82&Itemid=142. Accessed on August 12, 2016.

76. "DIAT Complements DRDO Labs, says Parrikar", May 31, 2016, <http://timesofindia.indiatimes.com/city/pune/diat-complements-drdo-labs-says-parrikar/articleshow/52523384.cms>. Accessed on August 10, 2016.

came up with a design and proposal for the fabrication of a solar powered mini UAV.⁷⁷ The model solar powered UAV, weighing 1.8 kg, was flown for two test flights in strong winds and cloudy conditions by rookie trainee engineers of the IITs. The duration of both test flights was curtailed due to emergency/crash landings. The result could have been much better if these IIT students had collaborated with experienced aviation experts from the design and development organisations. This also brings out the issue of aerospace research being carried out by leading academic institutions without adequate access to aviation development labs and industrial production facilities. There is a need to increase collaboration among academic institutions, aviation R&D laboratories and aviation industrial production facilities in order to improve the level of practical training as well as involving them in R&D.

R&D, PSUs AND PRIVATE COLLABORATION

Mr. T Suvarna Raju, chairman of HAL, during a seminar in September 2016, had called for greater involvement of the private sector in aerospace indigenisation. He invited private sector companies to participate in the supply of components and assemblies for the Hindustan Turbo Fan Engine-25 (HTFE-25), a 25 kN indigenous aero-engine,⁷⁸ ALH, LCA and other aerospace projects of HAL and the Indian Space Research Organisation (ISRO). He was concerned about the underutilisation of registered companies as only 50 to 60 companies out of 2,500 registered were effectively participating in the sub-contract work for HAL.⁷⁹

MSMEs and private sector companies, on the other hand, feel that PSUs are trying to encroach into their area of work rather than focussing on developing niche capabilities and producing strategically important and sensitive equipment. There is also a view that HAL and other PSUs have not been able to understand the concerns and difficulties of the MSMEs and other

77. "Design and Fabrications of Solar Powered Unmanned Aerial Vehicle", July 2014, http://www.umic-iitb.org/summer14/solar_uav.pdf. Accessed on August 23, 2016.

78. Boost for 'Make in India': HAL's 25 kN Aero Engine Completes Inaugural Run; Can be Used for Trainer Aircraft", December 14, 2015, <http://economictimes.indiatimes.com/news/defence/boost-for-make-in-india-hals-25-kn-aero-engine-completes-inaugural-run-can-be-used-for-trainer-aircraft/articleshow/50173767.cms>. Accessed on October 15, 2016.

79. n.61.

private sector companies. The underutilisation of registered companies by HAL is being viewed as the failure of PSUs to tap the potential of private sector entities.

Another challenge for public-private partnerships has been the inconsistent approach of the R&D organisations and PSUs for transfer of technology of indigenously designed products to private sector entities. Mini UAVs are likely to have both military and civilian applications, and transfer of technology of mini UAVs to private sector entities would have been a logical step.

However, the decision to transfer the designs of micro and mini UAVs by NAL to HAL, a public sector company, some time in 2014-15,⁸⁰ and not to a private sector company, indicates the challenges in public-private partnerships. HAL, on the other hand, is yet to commence production of micro and mini UAVs.

The uncertainty about who is going to produce indigenously designed products creates doubts as well as competition between private and public sector entities, which is avoidable. Therefore, there is a need to carry out a holistic assessment and work out the modalities for delineating products to be manufactured by the private as well as public sector entities. The production of strategically important and sensitive products could be entrusted to the PSUs and other products to private sector entities by an independent agency for greater efficiency and improving the rate of production.

OTHER CHALLENGES

Absence of Civil-Military Integration

The integration of design and development of aerospace products for civil and military aviation has not received due consideration in India.

80. Krishnan M, n.46.

There is need to increase collaboration among academic institutions, aviation R&D laboratories and aviation industrial production facilities in order to improve the level of practical training as well as involving them in R&D.

The absence of a programme for indigenising commercial civil aircraft, fewer aircraft required for the military and aspirations to procure proven platforms adversely impact the economic viability of indigenous aviation development programmes.

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Lack of Synergy Among Stakeholders

There are many agencies involved in the design and development of civil and military aerospace products. NAL of the Ministry of Science and Technology has been involved in developing civil aviation technologies. DRDO and HAL of the Ministry of Defence have been developing and producing military aviation products. The Ministry of Civil Aviation (MoCA), Airport Authority of India (AAI) and Directorate General of Civil Aviation (DGCA) do not generally get involved in developing enabling technologies for civil aviation. In addition, the private sector is slowly entering civil and military aviation. However, all these entities are working as individual organisations, with little coordination and synergy, despite many attempts to do so, which is not helping the cause of indigenisation and 'Make in India'.

CERTIFICATION AND QUALITY ASSURANCE

The Centre for Military Airworthiness and Certification (CEMILAC) and DGCA are responsible for certification of military and civil aviation products. The Directorate General of Aeronautical Quality Assurance (DGAQA) and DGCA are responsible for quality assurance in the defence and civil aviation sectors respectively.⁸¹

CEMILAC: CEMILAC is a certification agency for military aviation products in India, which initiates certification only on receipt of a requirement

81. n.77.

from a user viz. the Indian armed forces. However, it does not provide certification to innovations or start-ups that intend to develop futuristic technologies.⁸² CEMILAC would need to gear itself to provide certification for the same without having received the requirement from the users. Similarly, users would need to work out a methodology to integrate innovators in their future acquisition plans to stay ahead in niche technologies.

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DGCA: The level of involvement of DGCA in certification for the civil aviation sector has much scope for improvement. DGCA does not normally undertake research and development of technologies or for building capability to undertake such tasks. It normally adopts standards set up by the European Aviation Safety Agency (EASA)/ Federal Aviation Administration (FAA)/ International Civil Aviation Organisation (ICAO). There is need to change this approach and DGCA needs to consider adopting a proactive approach in developing capabilities and technologies.

There is a need for upgrading the capability of DGAQA and DGCA for certification of military and civil aviation products.⁸³ The need for strengthening CEMILAC and DGCA was also highlighted in the report of the Planning Commission working group on the aerospace sector in 2012.⁸⁴

Certification of IDDM Products: Indian companies undertaking indigenous design, development and manufacture of aerospace products do not get preferential treatment. There is neither a designated independent agency with the requisite experts to assess the technical and technological indigenisation nor is there any laid down criterion to assess IDDM products.

82. Mr G Gouda, Scientist G, Group Director (Propulsion), CEMILAC, during the 11th International Conference on Energising Aerospace Industry, held at Delhi on September 1, 2016,

83. n.86.

84. Ibid.

IDDM products designed by public sector and private sector companies lose out to the established players as the indigenous products are in the development phase and may not be able to match the global standards in absolute terms but could hold a promising future in terms of indigenisation and strategic autonomy. The existing system favours the established players as indigenous designs are considered for induction only if they meet all the Qualitative Requirements (QRs) and become L1. Therefore, indigenously designed products do not receive the desired support in the absence of laid down criteria and an empowered committee of experts to assess the indigenisation contents.

The absence of an independent agency, which is competent to assess the indigenisation content in the IDDM products and approve acquisitions without going through the established norm of Request for Information (RFI), Request for Proposal (RFP), etc. is an area which makes it difficult for innovators and developers to produce new designs, products or technologies indigenously. Often, private sector and PSU laboratories develop some of the best or new enabling technologies but fail to compete with the leading aviation giants, as they are unable to develop a complete product due to technological and other difficulties. These technological innovations, if preserved, can provide a giant leap to the indigenisation effort. Such technological innovations of the PSUs end up in their historical records and private sector entrepreneurs often sell their innovative designs and products to aviation giants or become their sub-contractors. India has been losing many such enabling technologies to foreign OEMs due to a lack of a mechanism to harness these innovations.

TRIAL AND TESTING SITES⁸⁵

There is inadequate infrastructure, i.e. laboratories and test facilities, etc. for developing the indigenous aerospace industry, in both the public and private sectors. In order to overcome these limitations, DRDO is building an Aviation Test Range (ATR) at Challakere in Chitradurga district of Karnataka, about 200 km from Bangalore. The test range will facilitate testing

85. Jha, n.32.

of fighter aircraft, UAVs, Airborne Warning and Control Systems, etc. The inauguration of ATR, initially planned for mid-2016, has been delayed.⁸⁶ The test range would have an aerodynamic test facility, an engine test facility and a test range for aircraft, helicopters and UAVs. An engine test facility was planned to be set up at Rajanukunte near Bengaluru.⁸⁷

The above facilities would meet the requirements of the PSUs and government controlled R&D agencies. However, they do not meet the requirements of the private sector and start-ups. There is need to earmark certain areas where MSMEs, start-ups and other private sector entities can utilise these facilities to design, develop and test UAVs and other aviation products.

Often, private sector and PSU laboratories develop some of the best or new enabling technologies but fail to compete with the leading aviation giants, as they are unable to develop a complete product due to technological and other difficulties.

SKILL DEVELOPMENT: INITIATIVES AND CHALLENGES

Another problem faced by the Indian UAV manufacturers is lack of adequate skilled labour.⁸⁸ Their products do not match global standards in terms of quality and they are not able to keep the cost competitive in the regional and global markets. India's aerospace development programmes have faced several challenges in recruiting engineers and technicians for designing and producing aviation products. The requirement of engineers and skilled technicians was met by a combination of retired armed forces technicians and some civil institutes providing training on these skills. However, the rapid expansion of civil aviation, commencement of MRO services, sub-contract work of aviation leaders in India, resurgent PSUs,

86. "Challakere: DRDO's Test Range May Open in June", May 26, 2016, <http://www.deccanchronicle.com/nation/current-affairs/260516/challakere-drdo-s-test-range-may-open-in-june.html>. Accessed on August 13, 2016.

87. "DRDO to Open 5,000-acre Aeronautical Test Range in Chitradurga by Mid-Year", May 26, 2016, <http://www.defencenews.in/article/DRDO-to-open-5,000-acre-Aeronautical-Test-Range-in-Chitradurga-by-mid-year-5416>. Accessed on August 13, 2016.

88. Vipul Singh, Co-founder of Aarav Unmanned Systems Private Limited, delivering a lecture at UAS2016, organised at India International Centre, New Delhi, on August 18, 2016.

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etc. increased the requirement of skilled engineers and technicians, which the existing set-up is finding difficult to match up to. This created the need for training a greater number of cabin crew, ground support services and cargo handling staff. The initiatives taken by the government and private sector, especially under the skill India programme, are covered below.

Aerospace and Aviation Sector Skill Council (AASSC): AASSC was set up under Section 8 of the Companies Act, 2013, on

September 12, 2014, at Bangalore with HAL, Bangalore Chamber of Industries and Commerce (BCIC) and Society of Indian Aerospace Technologies and Industries (SIATI) as promoters under the National Skill Development Programme. KPMG Advisory Services Private Limited was appointed by AASSC on April 16, 2016, to prepare a roadmap and develop National Occupational Standards (NOS) for job roles by October-November 2016 in the following sub-sectors:⁸⁹

- Aerospace Design and Development.
- Aerospace Manufacturing and Assembly.
- Airline Operations.
- Airport Operations.
- Airport Operations, Cargo and Ground Handling.
- Maintenance, Repair and Overhaul (MRO).

Private Sector Initiatives: Boeing, Tata Advanced Materials Limited Aerospace Facility and Nettur Technical Training Foundation (NTTF) announced a three-year diploma course in aerospace manufacturing technology (advanced composites) under their skill development programme to train frontline workers for the aerospace industry in March 2016. NTTF is

89. "Aerospace and Aviation Sector Skill Council", <http://www.aassc.in/about-us/aassc-3/>. Accessed on September 3, 2016.

a partner in the National Skills Development Corporation.⁹⁰

Ministerial Initiatives: The Airport Authority of India (AAI), National Skill Development Corporation (NSDC) and National Skill Development Fund (NSDF) signed a tripartite Memorandum of Understanding (MoU) for setting up skill development centres in the aviation sector in June 2016.⁹¹

Challenges in Skill Development: The above skill-oriented programmes are primarily aimed at meeting the requirements of civil aviation and do not address the indigenous design, development and manufacturing aspects. The programmes of AASSC are ambitious; however, some of the key programmes are still in the planning stage and appear to be moving very slowly in addressing crucial aspects like skilling in the design, development and manufacturing domains under the 'Make in India' initiative. Another significant aspect of skill development is non-availability of literature and resources in high-end technology. Indian universities and selected private sector entities need to be made partners for developing and producing high-end technology products in order to develop an R&D culture.

ASSURED ORDERS

Indian private sector entities are reluctant to buy indigenous designs from the public sector design (R&D) agencies for mass production since there are no assured orders. It has been seen that countries like the US and China have developed their indigenous industries by providing whole-hearted support to indigenously designed products and placing assured orders with the production agencies. The defence industries of the US and China also face technological challenges, costs overruns, etc., which are addressed through increased funding on R&D, collaborations, etc. The US Air Force (USAF) and People's Liberation Army Air Force (PLAAF) are predominantly equipped with indigenously produced fighters, bombers, transport aircraft

90. "BOEING, TATA, NTTF Announce Skills Program for Aerospace Sector", March 28, 2016, <http://www.boeing.co.in/news-and-media-room/news-releases/2016/march/boeing-tata-nttf-announce-skills-program.page?> Accessed on September 3, 2016.

91. "Strategic Partnership Between Ministry of Skill Development and Entrepreneurship and Ministry of Civil Aviation to Boost to Skill Initiatives in Aviation Sector", June 8, 2016, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=146064>. Accessed on September 3, 2016.

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and helicopters despite their limitations. The US laws prohibit procurement of arms from foreign vendors. Similarly, surety of business is likely to motivate Indian entrepreneurs, MSMEs and other private sector entities to invest in defence manufacturing and applied research, and take calculated risks.⁹²

DELAYS AND COST OVERRUNS

The cost overruns due to delays in the completion of the projects are a major cause of concern for most developers as well as users. The delays in completion of the projects can be attributed to, firstly, technological challenges, and, secondly, change of QRs by the users. The French Director General for Armament (DGA⁹³) is the single agency, which is technically qualified and responsible for procurement of armaments for the French defence forces. The French government has introduced the “Responsibility Principle” to address the issue of cost overruns and delays. In this system, whoever fails to meet contractual obligations—whether the manufacturer (or contractor) or government (the armed forces are responsible for, say, change of QRs)—pays for the escalation of costs.⁹⁴ The cost overruns had reduced with the introduction of this system.

ABSENCE OF UAV REGULATIONS

Impact of Ban: The private industry has seen a marked reduction in small UAV development programmes since the imposition of the ban on operations of civil drones by the DGCA in October 2014. The DGCA came up with Draft Guidelines for obtaining the Unique Identification Number and Operation of

92. Singh, n.55..

93. Direction générale de l’armement

94. “Committee of Experts for Amendments to DPP 2013 including formulation of Policy Framework,” <http://www.mod.nic.in/writereaddata/Reportddp.pdf>. Accessed on January 17, 2017.

Unmanned Aerial Systems (UAS) in April 2016.⁹⁵ The operation of civil UAVs continues to remain banned and final rules were still awaited at the time of writing. The growth of the civil UAV industry has stagnated since then. According to Vipul Singh, a UAV start-up co-founder,

Most of the UAV companies in India are start-ups, which have been badly hit by the ban on civil UAV operations and lack of regulations and guidelines for undertaking R&D, testing and trials of UAVs. The delay in releasing the guidelines has adversely impacted the investment eco-system in terms of funding the start-ups for UAV development. The start-ups, which had developed UAVs indigenously prior to the ban, were unable to commercialise them and move to the next level. This is demotivating private investors to invest in this domain.⁹⁶

The ban on civil UAV operations in India is having an adverse impact on the private sector's participation in R&D as well as on the growth of the civil UAV industry.

ADVERSE IMPACT OF COLLABORATIONS AND JOINT VENTURES

Collaborations and joint ventures can only support indigenisation or 'Make in India', if they are planned and executed to achieve well-defined objectives, which support indigenisation. Collaborations and joint ventures with foreign OEMs, without specifying clear objectives, could prove counter-productive and their likely impact is deliberated upon in the succeeding section.

Developer to Integrator: The emphasis on collaboration/joint ventures could encourage PSUs to collaborate with leading aerospace

95. Guidelines for obtaining Unique Identification Number (UIN) and Operation of Civil Unmanned Aircraft System (UAS), April 2016, [http://www.dgca.nic.in/misc/draft%20circular/AT_Circular%20-%20Civil_UAS\(Draft%20April%202016\).pdf](http://www.dgca.nic.in/misc/draft%20circular/AT_Circular%20-%20Civil_UAS(Draft%20April%202016).pdf). Accessed on October 25, 2016.

96. Vipul Singh, Co-founder and CBDO, Aarav Unmanned Systems, email dated October 24, 2016.

manufacturers in producing aerospace products in India and achieving 'Make in India'. However, this could result in Indian PSUs shifting their focus from developing core technologies to becoming integrators of imported technologies.

Meagre Technology Gains: Many foreign OEMs are wooing Indian private and public sector companies for joint production to meet the requirements of 'Make in India' while retaining the core technology. In a joint venture, the Indian company would normally be assigned the task of providing low-end technology support like assembly of the product, MRO services, providing maintenance support and acting as a point of contact for channeling spares from the foreign OEM. Therefore, there is unlikely to be significant technology gain in real terms in joint ventures.

Scuttling of Indigenous Project: India was the first country in Asia to produce supersonic jet aircraft (the HF-24 Marut), which was first conceived in 1967 and had served in the IAF during the 1970s. The Marut's design was based on the 3,770 kgf Bristol Siddeley Orpheus after-burning engine. However, the British discontinued production of the engine and India had to be content with the non-after-burner Orpheus 2,200 kgf engine, thus, making the Marut significantly underpowered.⁹⁷ India's efforts to procure engines from other aerospace companies were not successful and it was instead offered licensed production of the MiG-21 fighter aircraft. As a result, the Marut was shelved after limited production, and the technological gains made in its design and development were lost in due course. The licensed production, on the other hand, normally involves assembly of aircraft, and the gains are limited to acquiring production technology and processes.

India is again in a similar situation but with an advantage of having a huge economy and its R&D agencies developing a wide variety of aircraft, UAVs and other systems indigenously, which have the potential to become successful products if persisted with. With this background,

97. Larkins D'Souza, "LCA Tejas is not India's First Indigenous Fighter Plane: A HF-24 Marut Story", July 7, 2016, <http://www.defenceaviation.com/2016/07/lca-tejas-is-not-indias-first-indigenous-fighter-plane-a-hf-24-marut-story.html>. Accessed on September 30, 2016.

many aerospace companies are now ready to collaborate and form joint ventures with PSUs for joint production of manned and unmanned aircraft. The PSUs could be tempted to enter into such agreements in order to produce products without following the unpredictable and difficult path of indigenisation. However, such collaborations and joint ventures may not result in adequate technology gains as the collaboration partners are unlikely to transfer critical technologies. As a result, the country would continue to remain dependent on foreign OEMs.

Joint ventures and collaborations could result in shelving of indigenous projects or make them economically unviable due to the reduced demand. The technological gains made during the design and development process could be lost. Joint ventures and collaborations, without clear-cut technology gains at the national level, could prove to be counter-productive. This may give a false sense of indigenisation and is not a desirable outcome of the 'Make in India' initiative.

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PROPAGANDA AGAINST INDIGENOUS PROJECTS

Aviation projects the world over take decades to mature and such projects, being complex in nature, often face several technological challenges during the design and development phase. If such indigenous projects show significant progress and are viewed as competitors to the products developed by global aviation giants, they are subjected to aggressive propaganda against them. Indigenous projects are shown in a bad light by pointing out their isolated failures to create a public opinion against continuation of R&D in indigenous projects.

India's policy of 'Make in India' needs to take into consideration economic, technical and strategic issues. No country or company would shift its production facilities unless it is compelled to do so. Also, India needs to have a roadmap which identifies machinery, technologies and other capabilities that it aims to acquire.

TECHNOLOGY DENIALS

India's journey to indigenisation has not been without technology denials. India's endeavours in UAV development were dependent on the US for some critical parts. The US State Department had withdrawn export licences for certain components ((MOOG rotary actuators by the MOOG Group, USA) on Missile Technology Control Regime (MTCR) grounds, which were critical for the Rustom UAVs. As a result, India was forced to indigenise these components, which were in the testing stage in 2015. The restrictions helped India indigenise these critical components but at the cost of delays in the projects.⁹⁸

LIMITATIONS OF 'MAKE IN INDIA'

Mr. T Suvarna Raju, chairman HAL, emphasised that formulation of favourable policies like increasing the Foreign Direct Investment (FDI) limit from 26 percent to 49 percent and 100 percent with the approval of the Indian government has not attracted many foreign OEMs to invest in 'Make in India', indicating the limitations of investment in this strategically important high technology sector. The regulatory, contractual and other systematic gaps are exploited by the foreign OEMs to avoid meeting the obligations of indigenisation under the 'Make in India' initiative. Mr. Raju had advised foreign OEMs to focus on 'Make in India'.⁹⁹ India's policy of 'Make in India' needs to take into consideration economic, technical and strategic issues. No country or company would shift its production facilities unless it is compelled to do so. Also, India needs to have a roadmap, which identifies machinery,

98. Jha, n.32.

99. n.61.

technologies and other capabilities that it aims to acquire. India needs to show the will to accept or reject proposals which do not meet the 'Make in India' criteria.

However, the problem of 'Make in India' is not limited to foreign OEMs. India's R&D organisations, PSUs and the private sector too have some challenges as well some weaknesses, which need to be addressed. The lack of coordination among various stakeholders creates gaps between indigenous R&D endeavours and manufacturing.

Users normally assess the complete products and do not assess indigenisation of enabling technologies. There is no certainty that indigenously designed products would be selected for induction by the armed forces. There is no independent agency which assesses the level of indigenisation before clearing procurement from foreign OEMs. It needs to be understood that delays and technological challenges are inescapable realities in pursuit of developing indigenous capability. Also, there is no joint mechanism to assess the weaknesses of indigenously designed products, and efforts are required to overcome them by acquiring enabling technologies to make them compliant with the users' requirements rather than going for outright purchase.

SUMMATION

The demand for UAVs is rising in both the military and civil sectors. The Indian armed forces need a wide variety of UAVs, which include micro, mini, tactical, MALE, HALE, rotary UAVs andUCAVs. There would be a requirement of sensors and weapons of different weights and sizes for carriage by these UAVs. However, the indigenous UAV industry is finding it difficult to meet the requirements of the Indian armed forces, which could result in the armed forces importing them and thereby increasing India's dependence on foreign suppliers. The civil UAV operators are procuring UAVs from foreign vendors as well as by assembling UAVs by

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The PSUs need to come up with sound business, marketing and product support strategies to become competitive in this sector. India should be prepared to deal with adverse propaganda and ensure that indigenous aviation development programmes are not shelved.

integrating components, sub-assemblies and developing software indigenously. The lack of indigenous capability in certain essential technologies is a major limitation of the indigenous UAV manufacturing industry, which is resulting in continued dependence on foreign suppliers.

The lack of skilled manpower and enabling technologies in the aviation sector adversely affects the quality of indigenously manufactured components and sub-assemblies, which do not match the global standards. The ongoing skilling initiatives do

not provide practical and result oriented training to engineering students for developing cutting edge technologies indigenously. The other challenges faced by the PSUs and R&D agencies include retaining bright researchers, and technology denials, during the process of developing elusive technologies. The collaborations and joint ventures with leading aviation giants often end up as assembled in India without much technological gains.

The smaller quantity of orders adversely impacts the economic viability of products, which has been a major hurdle in involving the private sector in the indigenous production. India has been unable to plug the gaps in the three critical phases of product development: first, between the conceptualisation of an idea and the designing of the product; second, between the design and the commercial production; and, third, between the commercial production and meeting the aspirations of the users. These gaps do not allow indigenous designs to become commercially successful products. Improving coordination among the various stakeholders involved in the above three stages is of utmost importance to revitalise the aerospace eco-system. In addition, weak business models and poor product support weaken the credibility of the indigenous products. The PSUs need to come up with sound business, marketing and product support strategies to become competitive in this sector. India should be

prepared to deal with adverse propaganda and ensure that indigenous aviation development programmes are not shelved. Factors like vitalising academic institutions, collaboration among various stakeholders, etc. need to be addressed. Transformational changes may be needed for addressing these challenges and for achieving synergy among various stakeholders i.e. government ministries, DRDO, R&D agencies and PSUs. The non-availability of an empowered and independent council to carry out technical evaluation of indigenous content in IDDM is one of the major hurdles in harnessing the potential of indigenous innovators towards achieving indigenisation and succeeding in the 'Design and Make in India' campaign.

JOINT HELICOPTER OPERATIONS: A PRAGMATIC APPROACH

BS NIJJAR

PROLOGUE

In an article in the *Air Power Journal (APJ)* titled “Attack Helicopters: Where do We Use Them? Who Should Use Them and for What?”¹, an Indian Air Force (IAF) veteran batted for the “repository” of Attack Helicopters (AHs) to be under IAF control rather than the army. The response from the army was almost immediate in the form of an issue brief by a senior serving army officer in an article titled “The Attack Helicopter: Cause Célèbre”,² which highlighted a counter perspective of the army. Meanwhile, the media houses reporting on the defence related issues have been gleefully reporting on the ‘fight’ between the army and IAF for ownership³ of the AHs since the Kargil operations of 1999.

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1. Group Capt. A.G. Bewoor (Retd), “Attack Helicopters: Where do we Use Them? Who Should use Them and for What?”, *Air Power Journal*, vol. 9, no.4, Winter 2014 (October-December), p.51
2. Lt. Gen. Ghanshyam Katoch, “The Attack Helicopter-Cause Célèbre”, Centre for Land Warfare Studies, Issue Brief, no. 60, August 2015, www.claws.in/images/publication_pdf/660307159_IB-60-Katoch-08-09-15.pdf. Accessed on July 15, 2016.
3. “Solution soon on Army, IAF Spat over Choppers: Antony”, *The Indian Express*, October 9, 2012”, <http://archive.indianexpress.com/news/solution-soon-on-army-iaf-spat-over-choppers-antony/1014177/>. Accessed on August 11, 2016.

Joint operations became the “buzzword” after the Kargil War and the discussions thereafter have centred on this concept, with the solution being expected to be found in the creation of the post of the Chief of Defence Staff (CDS).

These controversies and canards continue to be spread despite clear clarifications having been issued by the government,⁴ as also an acknowledgement of the need to meet all the aviation requirements as projected by the army. In the Technology Perspective and Capability Roadmap (TPCR) issued in April 2013 by the Headquarters Integrated Defence Staff (HQ IDS), based upon the Long-Term Integrated Perspective Plan (LTIPP) 2012-27, which, in turn, is an approved document issued by the Defence Acquisition Council (DAC) in April 2012, the “aviation” requirements of the three Services are clubbed under one sub-head, indicating a conscious effort to exploit the aviation assets in a joint manner.⁵

Joint operations became the “buzzword” after the Kargil War and the discussions thereafter have centred on this concept, with the solution being expected to be found in the creation of the post of the Chief of Defence Staff (CDS). However, only time will tell whether this panacea aimed at ensuring jointness among the three Services, if and when implemented, would bring about the desired results. A remark by a senior army officer about the current status of jointness among the three Services highlights the current situation. He states:

Today, if any jointness exists, it is only at the individual level, based on personal equations. At the institutional level, jointness is, no doubt, talked about and emphasised, but when it comes to implementation, virtually nothing happens⁶

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4. Rajat Pandit, “IAF not Army will get Apache Attack Helicopters”, *The Times of India*, April 2, 2013, <http://timesofindia.indiatimes.com/india/IAF-not-Army-will-get-Apache-attack-helicopters-Govt/articleshow/19331628.cms>. Accessed on August 13, 2016.
 5. Ministry of Defence, “Technology Perspective and Capability Roadmap (TPCR)-April 2013”, <http://mod.gov.in/writeraddata/TPCR13.pdf>. Accessed on August 11, 2016.
 6. Lt. Gen. Vijay Oberoi, “Doctrinal Challenges,” in Air Cmde Jasjit Singh ed., *Air Power and Joint Operations*, second edition (New Delhi: KW Publishers, 2007), p. 218.

These remarks highlight the impediments faced while translating a thought into practical tangible action. So a basic question arises as to whether another approach, a more pragmatic one, is required for achieving the desired results, especially in the case of future helicopter operations of the army and IAF, or would the future operations and inter-Service relations continue to be governed by the burden of historical baggage carried by the two forces?

THE HISTORICAL BAGGAGE

The ever increasing literature on the related concepts of “jointmanship” and “joint operations”, which interestingly have been around for centuries, is indicative of their importance and, at the same time, of their virtual unattainability. This desired versus actual gap would always remain intractable, as it is a function of advancement in the application of military thought and advances in war-waging techniques/technologies, which have been changing throughout the centuries and would continue to do so.

The periodic revolutions in war-waging technologies throughout the history of warfare were brought about by technological advancements ranging from the invention of gunpowder, artillery, tanks, aircraft, helicopters to the most recent Unmanned Aerial Vehicles (UAVs).

Skilful and balanced build-up and application of these capabilities thereafter came about, to be known as “operational art” which, in turn, influenced the manner in which wars were and are being fought. More often than not, the winning side was the one that could successfully adopt these techniques/technologies while overcoming the turf wars, which invariably occurred, and achieve a degree of synergy among the various components of its fighting forces.

With the advent of the machines capable of flying through the medium of the air, their utilisation in war-waging efforts was almost immediate. And as is inevitable, the introduction of the third dimension into the battle space brought about a revolution of sorts and also with it, friction between the old and the new. It was a major revolution in warfare, as, for the first time, enemy concentrations could be attacked without defeating its ground forces.

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One of the earliest uses of air power, a major technological advancement at the time, was in the form of tethered manned balloons filled with lighter than air coal gas, which were mainly used for observation duties. The turf wars and friction among the players involved were also not far behind.

In one of the earliest such examples of internal friction and turf wars, the French in 1802 had to disband their balloon corps due to disagreements within its command structure about its proper application. The American civil war of the 1860s also followed a similar path, when the union military planners disbanded their balloon operations within two years of successfully operating them. They did so despite significant advances and technological innovations and advantages accorded by the invention of mobile hydrogen gas generators. The disbandment of the balloon corps, as it was called then, within two years of its deployment, was primarily due to the animosity generated within the military command structure and the specialists who were operating the balloons. As one author comments about the disbandment of the Union Balloon Corps:

Despite his and his corps' valuable service, Lowe and the Balloon Corps were always viewed with disdain and mistrust by many in the Army. This was partly because they were a separate, civilian operation, partly because their pay was much higher than military pay, and partly because the entire operation was extremely expensive to maintain. All of this led to political problems for Lowe and the entire corps. Eventually, on April 8, 1863, Lowe resigned his position as Chief Aeronaut in disgust and returned to the private sector. Without his leadership, the Union Army Balloon Corps passed from existence within three or four months.⁷

7. A Civil War Story, "Civil War Balloon Air Forces," file:///Volumes/HP%20210/chapter%205/Civil%20War%20Balloon%20Airforce.html. Accessed on July 16, 2016.

However, despite these setbacks some of the early military thinkers had no doubts about the prospects of employing military might from the medium of the air. One of the prominent ones was the Italian Army artillery officer Giulio Douhet who is credited with the formulation of some of the earliest theories on employment of air power. But he too, faced the consequences of turf wars when he was court martialled and imprisoned for a year for forcefully advancing his theories.⁸ Subsequently, he was exonerated and promoted to a general officer in 1921. A fierce proponent of an independent air force, in the same year, he went on to pen the classic *The Command of Air*. Till his death in 1929, he continued to take on his detractors in the army by penning his thoughts on the economic aspects of war and continued to contradict his counterparts in the army.⁹

One of the prominent military thinkers was the Italian military thinkers artillery officer Giulio Douhet who is credited with the formulation of some of the earliest theories on employment of air power.

The writings by Douhet highlight the need felt by the air power proponents to free themselves from the classic applications of military might. At that time, there was an ongoing debate between the British Royal Army and the Air Ministry about the creation of auxiliary forces for the army. The same is highlighted by the following comment by Col Aimone Cat of the Royal Army wherein he argues a case for the auxiliary aviation arm of the Royal Army. He states:

The solution is not to say, "Let us sit down and see what we can do." Rather it should be as follows:

Royal Army: "My Aeronautical needs, strategic, tactical, and logistic, are as follows."

Air Ministry: " My resources for filling your needs are as follows."

Royal Army: " The organisation of my Auxiliary Aviation, based on my

8. Giulio Douhet, *The Command of Air*, trans. Dino Ferrari, ed. Joseph Patric Harahan and Richard H. Kohn (New York: Coward-McCann, 1942).

9. *Ibid.*, pp. 235-243.

The aviators of the time did succeed in carving out a niche for themselves within the conventional land forces. Their importance was reinforced, when the end of World War II was brought about by the twin aerial bombings of Hiroshima and Nagasaki, using long-range bombers.

needs and adjusted to your resources, is as follows.¹⁰

However, Douhet's response to this proposal stemmed from a basic understanding of human nature, when he said:

It is only human nature that if you can get something for free, you try to get as much as you can; and if you have to give away something for free, you try to give as little as you can. In practice, the system proposed by Colonel Cat would lead to this situation: In

order to get as much as possible, the army would exaggerate its needs. In order to concede as little as possible, the Air Ministry would be tempted to minimise its resources. In the end, therefore, the organisation of auxiliary aviation would be again arrived at by compromise, bargaining, that is, agreement.¹¹

Thus, the debate continued about the creation of separate aviation assets for the army and advancing the cause of a specialist air force.

However, the aviators of the time did succeed in carving out a niche for themselves within the conventional land forces. Their importance was reinforced, when the end of World War II was brought about by the twin aerial bombings of Hiroshima and Nagasaki, using long-range bombers.

This subsequently led to the emergence of independent air forces, with separate command and control structures, all over the world. But, at the same time, this development only added to the debate on the relative importance of one over the other (army/air force), leading to further acrimony and friction. However, one fact remained undisputed and that was the requirement of the domination of air space as a prerequisite for the success of any future

10. Ibid., p. 231.

11. Ibid.

military operation, along with an equally important element and a corollary, that no amount of air dominance can replace the requirement of boots on the ground for winning a war. This was the military thought prevalent at the time when the Indian Air Force was born.

The British were forced to stand up to their commitment and allowed the fledgling IAF to be born on October 8, 1932. A measure of reluctance is indicated by an announcement by the then Air Officer Commanding-in-Chief (AOC-in-C) of the Royal Indian Air Force (RIAF) Air Mshl Sir John Steel, in 1934, when he announced to a captive audience of Indian airmen (hawai sepoys, as they were called then) and officers, that he was going to disband the IAF.¹²

Fortunately, this did not happen and the measure of progressive thinking of the small group of pioneers is indicated by the distinct nature of the IAF, as mentioned by an author when he writes about the IAF of the early Thirties:

Unlike the Indian Army, where the ethnic regiments and separate kitchens was the rule, the Indian Air Force was totally secular. Why? Because the leaders and pioneers who hailed from different parts of the country, came together for undertaking the gigantic task of building an Air Force for free India. The cardinal principle was: they fight /work together, they eat together.¹³

At that time, the Indian Air Force functioned under the authority of an army general, the Commander-in-Chief (C-in-C) of India. Thus, the command was a joint one and a joint structure was in place for achieving the desired military objectives.

Postindependence in 1947, British officers were appointed as Commanders-in-Chief of Indian Army and the Chief-of-Staff of IAF respectively. The IAF Chief-of-Staff's pre-condition of total independence from the existing command and control structure was also accepted at the highest possible level of the Indian polity of the time.¹⁴

12. Somnath Sapru, *Combat Lore: Indian Air Force 1930-45* (New Delhi: KW Publishers, 2014), p. xiv.

13. Ibid.

14. George K Tanham and Marcy Agmon, *The Indian Air Force: Trends and Prospects* (Santa Monica: RAND Publications, 1995), p. 15

A degree of joint structure, however, did exist in terms of the Joint Chiefs of Staff Committee which met regularly. It was during one such meeting that the requirement for helicopters for the defence forces had come up for discussion. Notably, the requirement was put forth for all the three Services in a joint manner.

Thus, the hitherto joint structure prevailing at that time was changed and a separate vertical command structure was put in place, raised for the command and control of six fighter squadrons and one transport squadron of the IAF along with other air force assets, and which also presided over its subsequent expansion.

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EXPANSION OF HELICOPTER FLEET ALONG WITH TURF WARS

The Chiefs of Staff Committee (COSC) meeting held on April 9, 1949, had recommended the establishment of a helicopter flight. However, in July 1949, the Joint Planning Sub-Committee (JPC) had postponed the induction of helicopters indefinitely. The JPC, which was composed of officers from all the three Services, did enumerate the possible roles for the helicopter. The roles envisaged at that time were:¹⁵

- Transport support role for transport of personnel, equipment and casualties from and to areas which may be inaccessible by any other form of transport. Dropping of supplies and ammunition for isolated detachments and rescue of personnel from the jungle area.
- Air/sea rescue, with particular reference to air force and naval aviation requirements.
- Transporting intelligence personnel to and from enemy held territories.

15. History Division, GoI, *Requirement of a Helicopter Flight for the Defence Services*, Joint Planning Sub-committee Paper No.10(49), July 7, 1949, File No. 601/14513/H.

- Reconnaissance by senior military commanders and artillery reconnaissance (as an interim measure, these tasks were being carried out by Auster aircraft).
- Observation of fire.

As may be seen from the above, most of the roles envisaged, and agreed upon, by the three Services, indicated the roles to be in direct support of the army except the air/sea rescue role envisaged by the air force and navy.

Hence, it was the army which viewed itself as the Service for inducting the helicopter. However, the available skill set was either available with the Indian Navy that was eyeing acquisition of a aircraft carrier with onboard helicopter support or with the IAF.

At almost the same time, the army on its own, initiated a case for an independent "Intercommunication Flight" equipped with light aircraft for the carriage of VIPs, air ambulance work and signal use. This paper was submitted to the Chiefs of Staff Committee on November 18, 1949. This requirement, as claimed in the paper, was based on the fact that the United States Army maintained these flights and also formally specified the difficulties faced in obtaining air effort from the IAF due to having to "apply" to it for aircraft through long and complicated staff channels.¹⁶

In November 1949, the JPC rejected this request and asked the RIAF to continue providing the army with aircraft on an "as required" basis. This effectively marked the end of the army's attempts at having its own fixed wing assets for communication duties as well as for replacing the Austers.

Thus, the IAF which had initially been raised as an army cooperation squadron, had rapidly transformed itself into an independent force seen to be competing with the army for the allocation of available budgetary resources

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16. Ibid. Intercommunication Flight for the Army, JPC Paper No. 28(49)

The IAF placing the transport and helicopter assets under one directorate (Ops Transport & Helicopters) indicated a thought process that these assets were primarily for inter-theatre and intra-theatre transport of equipment and troops.

in order to undertake essentially army tasks, as viewed by the army.

The situation was further complicated when the same yardstick was applied to the subsequent acquisitions of helicopters in late Fifties and early Sixties, thus, heralding the serious turf wars over the control over the helicopters. Post-1962 War, the army's bid for light helicopters as a replacement for the small fixed-wing Auster aircraft was successful and it fructified in 1986 when the Army Aviation Corps (AAC), was formally created, with its own helicopter assets, which gave it the light

helicopters and control of the attack helicopters during operations.

The IAF had continued to view its transport and helicopter assets through the same prism despite the extremely versatile multi-role capability exhibited by helicopters in the offensive as well as combat support roles. This is evidenced by the IAF placing the transport and helicopter assets under one directorate (Ops Transport and Helicopters), indicating a thought process that these assets were primarily for inter-theatre and intra-theatre transport of equipment and troops. However, despite these frictions and acrimony, the IAF contributed significantly to the cause of army aviation by undertaking basic conversion training of all the army aviation pilots—a tasking which continues as on date.

But here the question arises, what impact did these turf wars, if any, have on the conduct of actual helicopter operations which, by the very nature of their capabilities and application, have to be undertaken in a joint manner?

What are the specific impediments to the concept of jointness in helicopter operations, which appear to be stemming from the myriad inter-personal relationships and individual interests, along with an innate urge to protect own turf and, in a purely military sense, by each arm wanting to establish and expand its ability in the entire spectrum of warfare?

These are best analysed by studying specific examples of application of heli-power in a joint manner during the conduct of various operations. But before that, the concept of jointmanship and joint operations needs to be understood clearly and reduced to certain mandatory tangibles against which its application in a specific operation can be measured and analysed.

JOINT OPERATIONS: TANGIBLE PARAMETERS

As already covered, the concept of joint operations is not new. The dream of any battlefield commander in modern-day technology-centric warfare is to possess multi-role fighting machines for the modern-day battlefield which are capable of undertaking all weather day and night operations in the air and/or land, and those which are capable of carrying precision munitions including air-to-air, air-to-ground and beyond visual range weapons, with enhanced battlefield survivability features, along with an inherent capability of transporting troops to an altitude of operations extending from sea level to 4 km, to name only a few.

However, till such type of fighting machine is invented, wars would continue to be fought in a synergistic manner by utilising the capabilities of individual forces, which complement each other's capabilities, thereby maximising the advantages of each and, thus, filling in the capability gap of each. This method of waging a war can be termed as joint operations (jointops). For measuring the degree and extent to which jointness has been achieved, there is a need to define certain tangibles or characteristics, which indicate the extent of jointness achieved. These are:

- **Type of War:** What was the type of conflict in which the platform was used? Was the conflict limited, total or a low intensity type.
- **Objective:** What was the stated objective of the planned joint operation.
- **Planning:** To what extent were the respective elements involved during the planning phase? Was the plan shared with all those involved and were their concerns addressed?
- **Authority/Command and Control Structure:** Were the type and capability of the command and control structure structure/interface put in place with

It is to be remembered that for a joint plan to be successful, there is a requirement of both a good leader and a good follower. To a large extent, the success of the operation is also governed by the authority vested in the leader as well his leadership qualities which are a complex conundrum of personality, attitude, experience, maturity and professionalism.

well defined responsibilities to ensure successful execution of the plan? It is to be remembered that for a joint plan to be successful, there is a requirement of both a good leader and a good follower. To a large extent, the success of the operation is also governed by the authority vested in the leader as well as his leadership qualities which are a complex conundrum of personality, attitude, experience, maturity and professionalism.

• **Availability of Intelligence/Planning/Briefing:** How exhaustive was the joint plan and the briefing?

• **Coordination /Training:** To what extent was the training undertaken prior

to commencement of the operation or the degree of familiarisation of the participating elements with the plan?

- **Team Performance:** How were the factors, which affect the team performance, like stress and conflict, handled in the execution phase? How was the plan actually executed by the individual elements and what was their overall contribution to the success/ failure of the plan?
- **Decision-Making:** Very few wars proceed as per plan. How was the situation handled as the operation progressed?
- **Success or Failure:** Was the operation successful in achieving its aims?
- **Implementing Lessons Learnt:** What affect did the operation have on future joint operations?

Having decided on some tangibles, let us use these to test some of the joint operations undertaken by IAF helicopters along with the army. For this purpose, the following operations will be examined from the aspect of jointmanship.

- Special Heliborne Operations (SHBOs) at Sylhet on December 6 and 7 during the 1971 Bangladesh liberation war.

- The Jaffna University heli-drop on the intervening night of October 11/12, 1987 during Operation Pawan as a part of the Indian Peace-Keeping Force (IPKF).
- The rocketry operations undertaken by helicopters as a part of Operation Safed Sagar in 1999.
- Operation Khukri undertaken by the Indian forces in Sierra Leone as a part of the UN peace-keeping force.

SHBOs AT SYLHET

The 1971 Bangladesh War was a well planned effort, with clear political objectives which defined the military aims. Under the direction of the then Air Chief Mshl PC Lal, one of the objectives specified was the use of helicopters to aid in the vertical envelopment of enemy concentrations through SHBOs.¹⁷

It was the air chief who handpicked Gp Capt Chandan Singh, a decorated transport pilot of the 1962 operations, who was to act as a single point contact with Lt. Gen. Sagat Singh, General Officer Commanding (GOC) of the army's IV Corps.¹⁸ Between them, they planned the utilisation of the entire helicopter resources in the eastern theatre which consisted mainly of Mi-4s at their disposal and, in addition, liaised also for additional fighter/transport air support, as and when required. It was also at the instance of the air chief that a number of IAF officers were seconded to various army formations for Forward Area Control (FAC) of duties, indicating the thoroughness of the planning involved.

Sylhet was the first one of many such SHBOs. Planning for the heli-drop was carried out at Kalaura helipad with an understanding obtained from intelligence inputs that the enemy troops had withdrawn from Sylhet.¹⁹ Thereafter, at 1000 hrs, Gp Capt Chandan Singh, along with Brig CA Quinn, commander, 59 Mountain Brigade, selected a landing site in Sylhet near

17. Arjun Subramaniam, *India's Wars* (Noida: HarperCollins, 2016), p. 362.

18. *Ibid.*, p. 388.

19. Brig Rattan Kaul, *Battle of Sylhet (East Pakistan)-07-16 December 1971 First Ever Heliborne Operation of Indian Army by 4/5 Gorkha Rifles (Frontier Force) December 18, 2015*, <http://www.bharat-rakshak.com/ARMY/history/1971war/431-battle-of-sylhet.html?tmpl=component&print=1&layout=default&page=> Accessed on August 15, 2016.

On the insistence of the Army and as the forces inducted had encountered heavy opposition, the initial plan of inducting troops by daylight only was changed by the onsite IAF commander (Gp Capt Chandan Singh). He decided to continue with the troop insertion by night in coordination with the FAC controller and undertook a test sortie by night to the landing zone.

Mirpara on the northern bank of the Surma river, east of the railway bridge. To ensure induction of the battalion before nightfall, take-off by the first wave of about four waves was planned between 1400-1430 hrs. On board the first helicopter was Flt Lt SC Sharma, a navigator commissioned on December 20, 1969, who, after receiving some training at Tezpur, about fighter operations, was seconded as FAC, along with the communication equipment, a LUP-734 portable radio set.²⁰

The first wave of Mi-4s of 105 Helicopter Unit which was led by Sqn Ldr CS Sandhu, was fired upon on landing but was countered by effective suppressive fire

directed by the FAC controller who took charge of the situation and directed the suppressive fire from an armed helicopter.

On the insistence of the army and as the forces inducted had encountered heavy opposition, the initial plan of inducting troops by daylight only was changed by the onsite IAF commander (Gp Capt Chandan Singh). He decided to continue with the troop insertion by night in coordination with the FAC controller, and undertook a test sortie by night to the landing zone. As soon as the FAC controller lit the fire to facilitate the landing by helicopter, the enemy troops started firing, and again Flt. Lt. Sharma thereafter accurately directed the firing by the accompanying armed helicopters [Chetak modified by rockets and flown by Flt Lt (later Air Cmde) CM Singla]. The onsite component commander Gp Capt Chandan Singh assessed the situation. He found that despite one of the soldiers being hit on the ground, the helicopter had suffered no damage. He thereafter cleared subsequent sorties, with Flt Lt Sharma ensuring that the landing zone was suitably indicated by lighting fires.²¹ The next day, the

20. Subramaniam, n.17, pp.376-378.

21. Air Cmde. Rajesh Isser, *The Purple Legacy: Indian Air Force Helicopters in Service of the Nation* (New Delhi: Pentagon Press,2012), pp.66-71

helicopter operations continued, as Brig Rattan Kaul recalls:²²

The Pakistanis pounded the landing area with artillery, but the helicopters, with the skill of pilots, landed, haphazardly though, to avoid areas that were being pounded and offloaded their load.

By twilight of December 8, 1971, two mountain guns (75mm/24mm) and B company of 9 Guards were heli-landed as reinforcements. However, as the situation unfolded, the demand for air support increased as the envisaged ground link-up was taking time and the operation had not really progressed according to plan. The Pakistanis had consolidated their positions and were undertaking repeated counter-attacks.

Thus, as the ammunition and other supplies were depleting by December 10, and with no sign of a link-up by the ground forces, IAF transport support was called upon to undertake supply drop sorties. The FAC controller, meanwhile, ensured that the Close Air Support (CAS) sorties flown by IAF fighters also pounded and strafed the Pakistani positions accurately. Using the call sign Hellcat control, he continued to coordinate aerial resupply and Casualty Evacuation (Casevac) missions till the cessation of hostilities on December 15, 1971. The operation meets all the hallmarks of a successful joint operation. Many such operations were undertaken during the 1971 Bangladesh Liberation War.

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THE JAFFNA UNIVERSITY HELI-DROP

The Indian armed forces were called upon for undertaking operations in Sri Lanka following a complex series of events involving personalities

22. Kaul,n.19.

The Jaffna University heli-drop was planned for the intervening night of October 11/12, by a senior army officer of the rank of major general, with the higher IAF authorities being completely left out of the decision-making process.

and organisations from India and Sri Lanka to settle the simmering Liberation Tigers of Tamil Ealam (LTTE) issue. The Indian Peace-Keeping Forces (IPKF) comprising 54 Infantry Division was inducted into Sri Lanka in July 1987, by IAF aircraft.

A Joint Operations and Intelligence Room (JOIR) was set up at Madras by June 30, 1987, along with an air force cell responsible for controlling all the air operations of the IPKF. But the effectiveness of this cell was extremely limited by lack of communications and inadequate staffing in the initial stages. Also,

the units deployed had no written instructions about the channels for their administrative and operational control. After the establishment of Jaffna air base, the functioning of the station commander was severely hampered due to the lack of secure communication links.

The helicopters were inducted into Jaffna on August 2, 1987. By October 8, 1987, the situation had worsened, and the army was tasked to initiate active operations against the increasingly violent LTTE. By October 10, Mi-8s were deployed to undertake the tactical tasks of positioning troops, along with ammunition, at various helipads. The Jaffna University heli-drop was planned for the intervening night of October 11/12, by a senior army officer of the rank of major general, with the higher IAF authorities being completely left out of the decision-making process.

The aim was to capture the top leadership of the LTTE who were expected to be present at the university. A briefing for the plan was carried out on October 10 itself, which entailed induction of 480 troops, including 120 commandos of 10 Para and 360 jawans of 13 Sikh Light Infantry (LI). The 13 Sikh LI troops were still under induction to Jaffna and were yet to arrive in Sri Lanka. The plan was to induct 400 troops by four helicopters in five waves at 0100 hrs on October 12, with the commandos securing the Landing Zone (LZ) and lighting up the ground for subsequent landings.

The LZ was just four minutes from Palaly airfield. The LZ was to be recce by the four captains in a Chetak helicopter. However, only two of the four could carry out the recce. It was only after the recce by the IAF pilots that the small size of the LZ was highlighted and it was discovered that the LZ could accommodate only two helicopters.

It was, therefore, decided that even though the possibility of ground fire was remote, as briefed by the army, the second pair of helicopters would get airborne only after the first pair had commenced the return journey after disembarking the load. There was no rehearsal for the task nor was a joint briefing conducted between the air and ground force commanders, and to compound the situation, 13 Sikh LI was yet to arrive.²³ In addition, no contingency plans or alternate scenarios were discussed.

The LTTE was ready and waiting. The first two aircraft were airborne on time and reached the LZ as planned, however as the slithering of troops commenced, the LTTE opened fire from the second floor of the university and the pilots decided to land for offloading the troops instead of undertaking slithering. The Mi-8s took off and asked the second set of Mi-8s to be sent. The commandos meanwhile came under heavy sustained fire and could not light up the helipad. The second pair of Mi-8s had to abort the mission and landed back at Palaly. After landing at Palaly, the first pair of helicopters inspected the aircraft for signs of damage and took off again for the LZ for the second wave. The second attempt by the first two helicopters thereafter succeeded in inducting additional troops despite taking multiple bullet hits.

Unaware that the second pair had aborted the mission, the team leader was under the impression that 120 troops had been inducted when the actual count was 80. The situation was even more complicated as the Sikh LI troops were still being traced for induction and even when traced, they seemed unaware of the heliborne task. This led to a time delay, however, they managed to get airborne, with 15 jawans in each helicopter, as the Sikh LI was carrying huge ammunition boxes.

23. Air Mshl Bharat Kumar, *Operation Pawan: Role of Airpower with IPKF* (New Delhi: Manohar Publishers, 2015), pp. 112-137.

The blame game for the botched up operation ensued, with the army incorrectly blaming the IAF for inducting troops into the wrong LZ. Later, one of the glaring mistakes was found to be in the selection of the LZ. The LZ had only a one-way approach and was selected unilaterally by the army instead of a joint selection.

When these helicopters approached the LZ, the fire from the LTTE pickets was even more intense and accurate. In the hurry to disembark, the troops had forgotten to unload an ammo box which was offloaded by the flight engineer with the help of the co-pilot. Having come under sustained fire, the helicopters managed to recover safely at Palaly. Post landing damage assessment rendered all four helicopters not fly worthy. Effectively, only 150 of the planned 400 troops could be inducted. Subsequent fighting resulted in the loss of 6 para commandos and of the 30 troops of Sikh LI, only one survived as they had been tasked to secure the helipad, an open area devoid of any cover.

The blame game for the botched up operation ensued, with the army incorrectly blaming the IAF for inducting troops into the wrong LZ. Later, one of the glaring mistakes was found to be in the selection of the LZ. The LZ had only a one-way approach and was selected unilaterally by the army instead of a joint selection. It was considered to be a normal induction and was compromised from the outset, as the LTTE was well prepared and as was subsequently discovered, they had their gunsights accurately adjusted to the ranges involved. The LTTE was probably aware of the impending operation as a number of recce sorties had been undertaken of the site by the Chetak helicopters.

None of the higher agencies, the Joint Operations and Intelligence Room (JOIR), Southern Air Command or Air HQ knew about the mission. Having examined various aspects of the failed operation, Air HQ ruled that no such operations could be undertaken in the future without its express approval and ensured the presence of a senior officer at the JOIR, with better communication facilities.

OPERATION SAFED SAGAR: KARGIL 1999

The Pakistan Army had achieved complete tactical surprise in occupying the dominating heights over National Highway 1A in the Kargil sector. Analysis of the situation and thereafter formulation of a response resulted in the army undertaking Operation Vijay in order to evict the intruding Pakistani forces. The initiation of operations by the army resulted in a significant number of casualties and, thus, air support in terms of interdicting enemy supply routes and logistic bases was requested by the army.

Permission was granted by the Cabinet Committee on Security for restricted use of air power on May 25,1999. As the first air strikes were launched on May 26,1999, one army officer (Maj RS Adhikari) was also tasked to direct fire on enemy positions from an armed Mi-17 helicopter on May 26 and 27. According to him and the army, this firing of rockets from the Mi-17s had little effect.

These operations by the Mi-17s were discontinued when a Mi-17 crashed into the Tololing Nala on May 28,1999, at 1130 hrs after being brought down by the Manportable Air Defence System (MANPADS).²⁴Former Army chief Gen VP Singh writes:²⁵

In the second and third weeks of May 1999, the request from the Army for sending in Mi-35 helicopters or Mi-17 armed helicopters against the intruders could not be complied with. The Mi-35 attack helicopters were not employed due to terrain elevation. The request for Mi-17 armed helicopters was not accepted by the air force due to 'want of political clearance.' The need for political clearance for the employment of Mi-17 armed helicopters against terrorists and Pakistani Army personnel within Indian territory is a debatable point. Personally, I feel that in view of the operational urgencies and the need to take early decisions, such a requirement can be discussed and cleared at the highest levels in the command or service headquarters. There is no need for political clearance.

24. Gen VP Malik, *Kargil: From Surprise to Victory* (New Delhi: Harper Collins Publishers India, 2006) p. 158.

25. *Ibid.*, p. 244.

The IAF was aware of the escalatory effects of using air power and wanted the polity to be involved in the decision and the “Rules of Engagements” to be clearly specified. After the operations were over, the focus again shifted to the “handing over” of IAF helicopter assets to the army and, thus, the turf wars continued.

He further adds that there is “need for improved tactical and strategic intelligence gathering mechanism and wherewithal; better dissemination of intelligence; and the necessity for closer, real-time liaison between the Army and the Air Force at all levels. The conflict also highlighted the operational urgency of handing over armed and attack helicopter assets to the Army.”

The suggestion is not for the army to have own assets but for a “handing over” of assets held by the IAF. This was done even when the operational limitations of operational deployment of helicopters had been accepted and the IAF was thanked for all the support.

Indicative of the thought process prevalent at the time, it highlighted the army’s way of waging a war in a decentralised manner, with selective interpretation of the “political clearance” aspects put forth by the IAF. The IAF was aware of the escalatory effects of using air power and wanted the polity to be involved in the decision and the “Rules of Engagements” to be clearly specified. After the operations were over, the focus again shifted to the “handing over” of IAF helicopter assets to the army and, thus, the turf wars continued.

These acrimonious exchanges at the highest level, however, did not have any discernible effect at the operational level where the joint operations continued to be undertaken in a professional manner, as was evident in the next major joint operation.

OPERATION KHUKRI

The United Nations Mission for Sierra Leone (UNAMSIL) comprised troops from eight member countries, along with Military Observers (MILOBS) belonging to various other countries and was established in 1999 to enforce rule of law and included the disarmament, demobilisation and reintegration

of the rebels.²⁶ The IAF element operated as part of the mission from December 1999 to February 2001.

As a part of the mission, Operation Khukri was conducted between July 14, 2000, and July 17, 2000. The objective of the mission was to break the two-month-long siege of two companies of the 5/8 Gorkha Rifles (GR) Battalion comprising 212 troops and some British MILOBS, by affecting a breakout and redeploying them with their main battalion. Since British MILOBS were involved, British Royal Air Force assets comprising C-130s and two Chinook CH-47s were made available for the operation. Extensive planning was carried out which involved precise instructions for the IAF Mi-35s, Mi-8s and Chetaks(Ctks). The planning process included components of the Indian Army—artillery, special forces, mechanised forces as well as troops from 18 Grenadiers and 5/8 GR. A thorough briefing involving component commanders of all individual forces was carried out and the plan was suitably changed to address the concerns expressed by each. The limitations and capabilities of each component were understood by the rest. The aspects of air-space management and the artillery firing plan was also covered.

Hence, an “All Arms Team” concept, with integration of Mi-8s, Mi-35s and Ctks, with artillery, special forces, mechanised forces and other elements of ground forces was put to test once again, in an unfamiliar environment. The coordinated operation commenced on June 15, 2001, with a build-up phase on June 13-14, 2001. The operation involved Special Heliborne Operations (SHBOs) which included insertion of troops for area domination, assault and holding of key bridges and road heads, under artillery support and simultaneous operations by the mechanised forces.

The attack helicopters were used for air strikes, interdiction of rebel troops, suppressive fire and Continuous Over Watch (COW) duties. The Mi-8s were also used to extricate stores from the location where the troops were confined (Kailahun) and insert quick reaction troops and 18 Grenadier troops as per progression of operations. The Chetaks were used for keeping the continuous airborne communication relay post besides being used in the recce and Casevac roles. This led to the successful extraction of troops and

26. Isser, n.21, p. 235.

Post the unsuccessful Jaffna University drop, an exhaustive review resulted in the induction of attack helicopters, and all such operations thereafter were conducted under cover of attack helicopters. The initial decision of not inducting attack helicopters for the operations was also an army decision.

was followed up by many such operations during the conduct of the mission.

Hence, at the operational and functional levels, there was complete jointmanship exhibited in an international operation, with, forces from multiple nations involved. There was no indication of a 'turf war'.

SUMMARY OF THE CASE STUDIES

A close study of the selected cases indicates that, except in the case of the Jaffna University heli-drop, in all the cases, the objectives were achieved. Lack of authentic intelligence was also identified as a major cause of concern (with Operation Khukri as an exception). This lack of intelligence was made up by successfully adapting the plan as per the course of the conduct of operations. Post the unsuccessful Jaffna University heli-drop, an exhaustive review resulted in the induction of attack helicopters and all such operations thereafter were conducted under the cover of attack helicopters. The initial decision of not inducting attack helicopters for the operations was also an army decision.²⁷

The IAF, on its part ensured close monitoring of these operations through the Joint Operations and Intelligence Room (JOIR), Madras. Such operations of tactical airlift by Mi-8s/Mi-17s, supported by attack helicopters thereafter became a norm and played a pivotal role in the overall success of Operation Pawan. This was the first operation wherein the combined functioning of attack helicopters i.e. IAF assets maintained by it and used in operations catering to the Army requirements were undertaken. It is interesting to note that subsequently, some army aviation pilots were also trained by the IAF to fly attack helicopters.²⁸

27. Ibid; Kumar, n.23, p.135.

28 Dinesh Kumar, "Indian Air Force Training Army Pilots to Fly Attack Helicopters," Newspaper Clipping of The Times of India News service, dated October 3, 1994-1996 obtained from CAFHR.

However, with the passage of time, as more such joint operations continued, so did the “turf wars”, with, at one time, the army chief claiming: “*We have received a letter from the ministry and have been given the attack helicopters by the government*”,²⁹ for which an immediate rebuttal was issued by the IAF chief.³⁰

The success of the joint operations, despite the acrimonious turf wars, indicated the problem to be essentially one of command and control. The answer to this problem lay somewhere else. Thus, the essential questions for which answers were to be found were:

Was/is the battle or turf war and acrimony only about gaining permanent control?

and

What has been the actual impact of these turf battles on both the fleets?

This is significant, as the build-up of the helicopter fleet through the initial years was keeping pace with the expected requirements, however, post acquisition of the MI-17s in 1985, and despite the Kargil conflict, the expansion had slowed down and the IAF had countered it by increasing the TTL of the Mi-17s from 15 years to 35 years and had also reduced the tasking.

THE CAG REPORTS

The Comptroller and Auditor General (CAG), Government of India (GoI), conducted an audit on the operation and maintenance aspects of the “Mi-series” helicopters of the IAF, which constitute around 60 percent of its total helicopter fleet, and submitted its report³¹ in Financial Year (FY) 2010-11. The auditor pointed out a deficit of 26 percent in the total availability of helicopters compared to the numbers required for achieving the current operational projections. For attack helicopters, the

29 Ajai Shukla, “In a First, Army to Fly Attack Helicopters: October 13, 2012,” http://www.business-standard.com/article/economy-policy/in-a-first-army-to-fly-attack-helicopters-112101302002_1.html. Accessed on August 20, 2016.

30 Ibid.

31. CAG Audit Reports, “Operation and Maintenance of MI Series Helicopters of the IAF”, http://www.cag.gov.in/sites/default/files/audit_report_files/Union_Performance_Defence_Union_Government_Air_Force_and_Navy_7_2010.pdf. Accessed on April 11, 2016

holdings were projected to be 46 percent below the actual requirement. The report further added that the existing fleet is ageing and nearly 78 percent of the helicopters have completed their prescribed lives and Total Technical Life (TTL) extension has been carried out on them to elongate their lives. Serviceability levels were also projected to be consistently short of 75 percent.

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Similar sentiments were echoed by the then Chief of the Air Staff (CAS), who in an interview to a magazine in 2008, agreed that the acquisition process in the case of helicopters had suffered after the 1990s. However, he envisaged that the helicopter fleet would undergo a major transformation, with upgradation to the existing Mi-17s and Mi-35s. He also added that a global Request for Proposal (RFP) for 24 state-of-the-art attack helicopters and for 12 heavy lift helicopters was being carried out.³²

Further, in a report of the CAG audit of army aviation assets as a part of union government (defence Services), army, ordnance factories and Defence Public Sector Undertakings (DPSUs), the CAG observed:

Army Aviation Corps was created with the main objective of contributing to battlefield success by providing guidance to the field Commanders in applying decisive combat powers. The Corps is, however, plagued with 32 per cent deficiency against its authorised fleet strength. The helicopters held are old and ageing, with 52 per cent of the fleet more than 30 years old. Low level of serviceability of helicopters further

32. "IAF to Acquire 24 Attack and 12 Heavy Lift Helicopters-Gulshan Luthra", *India Strategic*, vol.2, issue 2, February 2008.

reduces the effective availability for operations, to 40 per cent of the authorisation.³³

Giving additional details, the report indicated the actual availability of helicopters for operations to be as low as 40 percent. This was significant as there was already a considerable gap between the authorised strength of 364 versus the actual strength of 246, as evidenced from Table 1 below, as mentioned in the report:

Table 1: Fleet of Army Aviation Helicopters (Source CAG Report 44 of 2015)

Helicopter	Type of Unit	Authorised	Held	Deficient Percentage
Cheetah	R&O	184	126	32
Chetak	R&O	62	55	11
ALH	UH	105	65	38
ALH(WSI)	AH	13	Nil	100
Total		364	246	

The year-on-year serviceability percentage state also showed a worrying trend.

Table 2: Year-on-Year Serviceability Percentage (Source: CAG Report 44 of 2015)

Year	Serviceability percentage of	
	Cheetah/Chetak	ALH
2010-11	65.88	39.75
2011-12	65.36	39.65
2012-13	68.75	47.96
2013-14	68.00	55.00
2014-15	58.00	38.59

The CAG further observed:

Despite these shortcomings, Army Aviation could not replace its fleet of Cheetah/Chetak helicopters being used for reconnaissance and observation, which are due

33. CAG Audit Report, "Union Compliance Defence Army Ordnance Report 44 of 2015," http://www.cag.gov.in/sites/default/files/audit_report_files/Union_Compliance_Defence_Army_Ordnance_Report_44_2015_1.pdf, paragraph 3.1. Accessed on August 20, 2016.

for de-induction since the 10th Plan period (2002- 2007) onwards. We observed that against 18 schemes approved in the 11th and 12th Service Capital Acquisition Plan, contract in respect of only four schemes could be concluded in a nine years period, so far. This failure in meeting the targets and objectives of the acquisitions plans and tardiness in procurement action were the main reasons denying the Corpssuitable replacement for the old and ageing fleet.³⁴

Severely critical of the procurement process, the CAG sought an explanation from the army. The army blamed the delay on the pending ownership issues with the IAF for the procurement of the Tactical Battle Support Helicopter (TBSH). Non-procurement of attack helicopters was blamed on the wait for a similar type of procurement to be processed by the IAF.³⁵ This reason is cited to having been given as recently as in August 2015 and is also mentioned in the report.

Thus, over the years, especially since the 1990s and after the creation of the Army Aviation Corps (AAC), acquisitions by both forces have suffered significantly. This has also resulted in reduced availability of overall helicopter assets for use in joint operations. However, there has been some respite, with the inductions of over 139 Mi-17 V5s.

Also, over the years, there is no evidence of the IAF not meeting tasks for which it had the capability. The IAF has also continued to upgrade its Maintenance, Repair and Overhaul (MRO) support infrastructure and has continuously built up its domain expertise while contributing to the skill set of Hindustan Aeronautics Limited (HAL) for indigenous production of helicopters.

Hence, the only effect that the acrimony has had, has been on the helicopter acquisition programmes of both Services. But the overall question and the core issues of discovering the root cause of the acrimony remain.

One way is to view the turf wars and the acrimony as essentially a high level management issue. The Army Aviation Corps is headed by its Director General (DG) who holds a rank of a major general. He is at the helm of a huge

34. Ibid.

35. Ibid., para 3.1.3.2, Table 18.

organisation, with a significant mandate, but with very few assets. The easiest way out seen by him is to take over IAF helicopter assets. But the question which needs to be answered is:

Is the only way out of this tricky situation to hand over/take over of assets, as advised by a former army chief or is there a possibility of an alternate solution being found by applying simple management concepts?

A MANAGEMENT PARADIGM

At this point of time, the bad news for the two forces seems to be that poor joint performance on the part of the affected players (army and IAF) has had an adverse

impact on the serviceability states, as also on the availability of helicopters, with a serious impact on their respective acquisition plans (which the army was looking to partly source from the IAF).

The good news, however, is that, despite these shortcomings, both forces have been able to meet all the allotted operational tasks and have the means and wherewithal of successfully negotiating the acquisition programmes in a synergistic manner. This would, in turn, also meet the shared operational objectives.

However, the past errors, which appear to be a result of “egos” having their way, need to be corrected by focussing on “What is right?” rather than “Who is right?”. This can be achieved by interconnecting the rigid vertical organisational structure of both the forces by forming better working relationships at the management level and sharing resources for the desired results. For this to happen, the authority gradient when connecting the verticals has to be optimum. The nominated leader would have his task cut out to restore the necessary synergy by ensuring that the team has the correct

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task allocation and a shared objective, and the different components are meshed smoothly.

However, this is easier said than done, as the focus presently remains shifted from “What is right?” to “Who is right?”. This has also brought the interpersonal conflicts to the fore. These were compounded, as after its formation, the AAC also started facing operational constraints, including limitations in its expertise in the maintenance of rotary wing helicopter platforms in an operationally ready state.

This, along with other interpersonal conflict issues, has resulted in the primarily personality oriented and rank dominated discourse, which has been detrimental to the

interests of both forces. A mention here must be made of the way the navy has developed its helicopter assets in consonance with the IAF by utilising its domain expertise and, at the same time, building an independent and formidable force. But what is the way out of this predicament, under the media and public glare, in which the two sister Services find themselves in?

A PRAGMATIC APPROACH

One approach, as suggested by Air Mshl Vinod Patney (Retd) proposed the term “joint planning for operations” instead of “planning for joint operations”.³⁶ This approach to fighting and winning a war, endeavours to bridge the divide created by inter-Service and, to an extent, intra-Service conflicts, by entrusting the planning aspects of any operation to a central body of experts from which the responsibilities and resource allocations would flow out. A variation of such an approach was central to the successful joint helicopter operations covered earlier as case studies and the absence thereof in the failed one.

36. Air Mshl Vinod Patney (Retd), in Air Cmde Jasjit Singh, ed., *Air Power and Joint Operations* (New Delhi: KW Publishers, 2003), p. 261.

Presently, the situation is getting further complicated with the IAF also wanting to expand the role of its own special forces in the form of “Garuds” and the army wanting to own the entire range of aerial assets, from fixed wing aircraft to attack helicopters, reviving a request first initiated way back in 1949. The resulting conflict situation is understandable, with each Service justifying the merits of the same as a part of its “force restructuring” strategy to fight future battles. Each Service quotes selectively from the lessons learnt during the wars waged in order to advance its own respective areas of interest.

Recognising the need and importance of the synergy which can be derived from various arms operating in coordination and harmony with each other, the Ministry of Defence raised the Centre of Joint Warfare Studies (CENJOWS) on August 24, 2007. One of the primary aims of the society is to rise above sectoral and departmental legacies, and examine joint warfare and synergy issues in their entirety, and initiate debates and discussions in an independent and unbiased milieu for the emergence of the best possible alternative.³⁷ But even after nine years, this remains, at best, a dream.

Historically, the easiest way out of these turf battles often has been a rather drastic one as was the case with the winding up of the Balloon Corps during the American Civil War, however, at this juncture, that simply is not an option to be exercised in the present IAF-army context.

Therefore, taking a holistic and pragmatic view, besides creation of a centralised joint planning cell, the following is proposed which caters to the strict hierarchical functioning of the army as well as the IAF-recommended centralised and flexible use of all heli-power. This is imperative in order to utilise the entire range of capabilities of the versatile platform in a synergistic and joint manner, and is also unavoidable as the new systems which are being inducted are redefining the hitherto strict jurisdiction limits of the individual domains of the army and IAF:

- The IAF to support the army in developing its aviation corps, and continue to share its domain expertise and knowledge. At the same time, cater to the joint warfare needs as demanded by the envisaged battle scenarios. The basic

37. CENJOWS, “About Us”, <http://www.cenjows.in/about-us.php>. Accessed March 10, 2016.

Technical Type Training (TETTRA) courses and basic conversion training on helicopters to continue to be undertaken by the IAF.

- The army, on its part, to develop its aviation in consonance with, and not at the expense of, the IAF, even though historical evidence indicates that at the time of induction and planning, the number of roles indicated the employability of helicopters primarily for army tasks. The domain expertise of the IAF and the support infrastructure developed by it over the decades necessitates avoidance of a parallel infrastructure catering to the MRO needs of each Service. Hence, joint MRO hubs, with the IAF as a leading partner, are recommended. This needs acknowledgement and acceptance by the army which has already created a large separate organisation under the leadership of a major general ranked officer.
- The IAF's engagement with the army must cater for an ideal authority gradient respecting the strict regimental structure of the army, with an understanding that the army fights its wars in a decentralised manner and leaves major operational decisions to its field commanders. The desired convergence can be achieved by ensuring a joint planning structure which is expertise oriented and composed of specialists and, at the same time, has an optimum authority gradient. A steep authority gradient as in the case of the Jaffna University helidrop needs to be avoided.
- The possibility of having a joint helicopter command structure with pooling of assets needs extensive debate and would be in the long-term interests of both Services as the preparations for future wars would continue to be almost prohibitively expensive and helinomics or the economics of operating helicopters will certainly play its part.

BACK TO THE FUTURE: AN ANALYSIS OF THE COMPREHENSIVE CONVENTION ON INTERNATIONAL TERRORISM

JAI RAINA

INTRODUCTION

As of December 2016, the Governments of India and Pakistan have been scrambling to have Sayyed Muzzakir Mudassar Hussain alias Munna Jhingra extradited to their respective countries. Currently imprisoned in Thailand, Munna is a noted member of the D-Company criminal outfit which has had strong links to the financing and facilitation of terrorist activity.^{1,2} Munna has been personally involved in the supply of narcotics and counterfeit Indian currency, and a key player in D-Company operations in Thailand.

India claims to have, and has, provided the Thai government significant evidence to establish Munna as an Indian national, while Pakistan claims Munna as one of its own (at the time of his arrest in 2000, he was carrying a Pakistani passport).³ Claims and counter-claims about Munna's rightful

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1. <http://www.southasiaanalysis.org/paper818>
2. https://www.un.org/sc/suborg/en/sanctions/1267/aq_sanctions_list/summaries/individual/dawood-ibrahim-kaskar
3. <http://www.hindustantimes.com/india-news/chotta-shakeel-s-hitman-s-extradition-turns-into-indo-pak-contest/story-spKs4aEzd5E6hLh0DwiK.html>

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place of extradition are, no doubt, a cause for great confusion for the Thai government. Cases such as this are not new in international law, and neither are actors like Munna who blur the line between “criminal” and “terrorist”.

It would be a remarkable step to see a development on the global stage that would alleviate such issues. But what if this development, the key to classifying, prosecuting, and even extraditing the Munna Jhingras of the world, had been suggested two decades ago?

The Comprehensive Convention on International Terrorism (CCIT) is such one legislation. In 1996, India proposed a convention aimed at addressing certain elemental (but controversial) aspects of terrorism. Broadly, the CCIT aims to: provide a universal definition of terrorism; create special procedures for the prosecution of terrorists acting across borders; unequivocally make illegal all terror groups and terror camps; and make cross-border terrorism an extraditable offence worldwide. An ad-hoc committee was established by Resolution 51/210 of December 17, 1996 to deliberate on the convention in the Sixth Committee of the UN General Assembly (UNGA), (the UN’s legal committee). However, since 1997, this committee has stood deadlocked.

Despite a lack of significant progress in the adoption of the convention, the Indian state has not withdrawn support for it. Typically, India reiterates support for the convention whenever it has been impacted by international terrorism, as was seen after the attacks on the Parliament in 2001 and the events of 26/11. The present government too seems to share an affinity for the proposed convention, with Prime Minister Modi making mention of it in his maiden address to the UNGA in 2014. More recently, the spate of terrorist attacks within India and in its neighbourhood (like those in Bangladesh) in 2016, have further cemented India’s interest in the adoption of this convention. In September of 2016, India’s Foreign Minister Sushma Swaraj appealed to the UNGA to end two decades of deadlock and adopt this “critical” convention.

This paper seeks to understand the CCIT and the reasons why this deadlock persists even after two decades and what is the possible future of the CCIT in the fast changing global world order.

BACKGROUND

In the discourse on terror, be it academic or otherwise, 9/11 appears to be the transformative event. It is not uncommon to see an analysis of terror being discussed in a paradigm of a world pre-9/11 and post-9/11. For a multitude of reasons that would merit their own paper, 9/11 changed not only the level of focus that terror received, but also conceptions about terrorism itself. In today's world, it is almost a logical progression for nations to push for a uniform and global law to address issues associated with terrorism.

However, the CCIT was proposed by India long before 9/11. Certainly, not in a world without terrorism, but in a world yet to give terrorism the place and priority in policy-making that it occupies today. What then motivated India to propose a comprehensive convention targeted at transnational terror way back in 1996, half a decade before 9/11? The answer is, of course, a multifaceted one, but this paper will limit itself to looking at it from a legal perspective, because, while terrorism may be viewed from the lens of varying socio-political constructs, laws are the most enforceable manifestation of such thoughts. In addition to this, as will be seen, the CCIT is more a legal document than anything else.

To begin with an understanding of India's views on terror, it should be acknowledged that many of the Indian state's most pressing internal disturbances have had a transnational tint to them. These "domestic but transnational" disturbances include the Naga secessionist movement immediately post-independence in 1947, the Maoist insurgency that began in

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the late 1960s, the Khalistani secessionist terrorists who were active between the 1980s-1990s, and in the same period, rampant terrorism in Kashmir. It is important to note that the Indian state doesn't label all of the aforementioned issues as terrorism (the difference in labelling brings with it significantly different legal implications). However, by 1996, India's experiences with Khalistani terror and the crisis in Kashmir, in particular, seem to have had an impact on the policy on terrorism of successive governments. After the end of the war in Afghanistan in 1989, a large number of militants who had been combating the Soviets, shifted their focus to Kashmir, widely held to be supported by the elements within the Pakistani state. By the 1990s,

violence stemming from terrorism, specifically from foreign fighters, escalated intensely. The 1990s in Kashmir are remembered as a particularly violent time, with cross-border infiltration, domestic insurgency, and secessionist activities all coming together to form a mishmash of confusion that defied neat categorisation. The view (that persists to this day) that military intervention in Kashmir was not enough, and to effectively combat terror, the Indian state would need a way to transcend the limitations of international borders, gained traction. Such a view may even be reflected in India's championing of the CCIT.

Under such circumstances, it would seem but natural for India to have proposed a convention in the vein of the CCIT. The CCIT, as its name suggests, was focussed on tackling the issue of terror, not India's other concurrent issues of insurgency, violent secessionism, separatism, etc. Before one delves into

the CCIT, it is important to pause and reflect upon the Indian government's perspective on terror. In many ways, what a government's view on terror is, decides if an activity is characterised as a terrorist activity. What distinguishes terrorist activity from other types of criminal activity is often a complex interplay of domestic security concerns as well as political considerations. That being said, in the domestic sphere, the definition of a terrorist can be tailored any number of ways, leading to a multitude of views all around the world.

So then, to further an understanding of the CCIT, one must ask how the Indian state chose to define terrorism legally (for the reasons mentioned above) in the years leading up to the presentation of the CCIT in 1996. The earliest domestic definition of a terrorist can be found in the Terrorist Affected Areas Act (TAAA) of 1984.

Section 2, sub-section H, stated:

...“terrorist” means a person who indulges in wanton killing of persons or in violence or in the disruption of services or means of communications essential to the community or in damaging property with a view to:

- putting the public or any section of the public in fear; or
- affecting adversely the harmony between different religious, racial, language or regional groups or castes or communities; or
- coercing or overawing the government established by law; or
- endangering the sovereignty and integrity of India...⁴

The TAAA was passed in the Parliament in response to the situation that had been escalating in Punjab since the late 1970s (especially the activities of the Khalistani movement). The TAAA was applicable to particularly designated areas and called for special courts to expedite the process of trying suspected terrorists. Expediting the often cumbersome Indian judicial process is a commonality that would go on to be shared with subsequent domestic legislations on terror. Coming to how the TAAA defined terror, we observe some aspects that are to be expected, such as killing/ acting violently and

4. Full text of the TAAA available on the South Asia Terrorism Portal, at <http://www.satp.org/satporgtp/countries/india/document/actandordinances/terroristaffectedaact.htm>. Accessed on January 2, 2017.

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damaging property. One unique addition made to the definition of a terrorist was that it extended to those persons who negatively affected the harmony between various religious/racial/regional, etc. groups within the country.

This reflects the focus on secessionist and separatist terror outfits that coloured the Indian government's conception of what a terrorist was. Following the TAAA was the TADA ("Terrorist and Disruptive Activities (Prevention) Act") of 1985. The definition of a terrorist remained much the same, with a focus on those affecting the integrity of India⁵, but the applicability of the Act grew. Where the TAAA only applied to specific areas, TADA had nationwide applicability. TADA also allowed for increased police powers with regards to confessions (as per Section 15, certain confessions made in police custody were permissible as evidence) as well as heightened penalties for terrorist activities. TADA remained in force till 1995.

Just as domestic political considerations were at work shaping the Indian view of terrorism, they were also a force in other countries, shaping the views of those nations. This is an important factor to acknowledge, as not only does it help us explore disconnects between views in the world at the time of the CCIT's being originally proposed, but also provides more context when studying a "universal" convention like the CCIT.

Around the time the TADA was to lapse, the United States too was creating some of its earliest definitions of terrorism. The bombing of the World Trade Centre in 1993 and the Oklahoma bombing two years later had necessitated

5. Section 3, Sub-section 1 reads: "Whoever with intent to overawe the Government as by law established or to strike terror in the people or any section of the people or to alienate any section of the people or to adversely affect the harmony amongst different sections of the people does any act..." Full text available at <http://www.satp.org/satporgtp/countries/india/document/actandordinances/TADA.HTM#3>. Accessed on January 2, 2017.

action. The World Trade Centre bombing involved foreign nationals operating in America, while the more devastating Oklahoma bombing was carried out by US nationals. Both involved the use of dangerous, but not impossible to source, chemicals and explosives. Along with a spate of legislation to increase security around federal buildings, the United States' legislature passed the Anti-terrorism and Effective Death Penalty Act of 1996 (AEDPA).

Domestically, the AEDPA had implications on the application of *habeas corpus*⁶ but more to our interest is its role in designating certain organisations as FTOs (Foreign Terrorist Organisations). The AEDPA laid down a detailed procedure by which a terrorist organisation would be designated. Once designated, the assets of an FTO would be frozen, individuals associated with it barred entry into the US, and those who aided FTOs with material and financial assistance would be subject to heavy punishment as well.

So, as can be seen, around the time the CCIT was about to be introduced, the concept of who a terrorist was and, more specifically, what activities needed to be curtailed, were somewhat dissimilar in India and the United States. From the Indian legislation, it would appear there was a focus on terrorism leading to internal instability. This was not so much the case in American legislation. This distinction is significant as in the years to come, America's experience with terror would impact views the world over.

Shortly after the attacks of September 11, 2001, the fight against terrorism went global. About two weeks after the event, on September 28, 2001, the United Nations Security Council (UNSC) passed Resolution 1373 unanimously. Resolution 1373 called for member states to have increased intelligence cooperation, ratify international conventions on terror into

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6. A more detailed explanation of the concept of *habeas corpus* can be found at <http://legal-dictionary.thefreedictionary.com/habeas+corpus>. Accessed on January 2, 2017.

This is significant because of the manner in which Resolution 1373 was adopted. Being a Security Council resolution, it became binding upon all member states. It carried even further (albeit non-binding) weight as it was adopted under Chapter VII of the United Nations Charter which pertains to determining and dealing with threats to international peace.

domestic law, adapt immigration law so as to not allow its misuse by terrorists, and also establish a counter-terrorism committee to monitor state compliance.

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What is interesting is that despite taking such a forward step, nowhere does the resolution define terror. Even the 13 odd international conventions that the resolution mandates member countries to ratify into law do not define terror. These conventions define aspects of terror certainly, but not what constitutes terror itself. For example, the Convention for the Suppression of Unlawful Seizure of Aircraft of 1970 lays down that it is a terrorist act to hijack a plane, the Convention on the Marking of Plastic Explosives for the Purpose of Detection (1991) deals with, as its name suggests, the making and storing of plastic explosives, and so on.

Of course, the omission of a definition of terror is not some hasty oversight but something of an apparent necessity in international law. As mentioned earlier, it is the state and the state's interests that define terror: not only is the definition of a terrorist a fluid one, but also one that is hard to gather consensus on in the global sphere. Many factors obscure a clear path to a definition.

Distinguishing among self-determination movements, acts of persons responding to unjust aggression, and other similar activities has generated much debate but little change in the UNGA. Though, under Resolution 1566, the UNSC did provide a definition of terror and stated that there was no valid justification for acts that are:

...committed with the intent to cause death or serious bodily injury, or taking of hostages, with the purpose to provoke a state of terror in the general public or in a group of persons or particular persons, intimidate a population or compel a government or an international organization to do or to abstain from doing any act, which constitute offences within the scope of, and as defined in, the international conventions and protocols relating to terrorism are under no circumstances justifiable by considerations of a political, philosophical, ideological, racial, ethnic, religious or other similar nature... ⁷

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The definition aspect of international terrorism is one that will keep coming up as this paper progresses.

Resolutions like 1373 and 1566 did little to harmonise international law with regard to terrorism. Certainly, member states assented to them (or, at least, to aspects of them) but the implementation of such laws was up to the state. Venezuela, for example, expressed serious reservations about freezing the assets of suspected terrorists while Russia went as far as to convert Resolution 1373 *ad verbatim* into domestic law. India passed POTA (Prevention of Terrorism Act) 2002, partially motivated by its obligation towards Resolution 1373 as well in response to the attacks that occurred on the Parliament of India in 2001. Though repealed now, POTA has had a lasting legacy on terrorism legislation in India, with many of its provisions finding their way into successive legislations on terror, such as India's present day definition of a terrorist. However, these developments do not appear to have made a world more amenable to the adoption of the CCIT, for along with debates regarding the definition of terror that have existed for decades, it now had to contend with a world that was adopting an increasingly Western-led conception of terror.

7. <http://www.un.org/press/en/2004/sc8214.doc.htm>. Accessed on January 2, 2017.

The US led War on Terror became a prime focus of international legislation on terror, the discourse, and on the ground efforts against terror in the international sphere. While the definition of terrorism remained as elusive as ever, which terrorist the globe should focus on did not. Nor did the means and methods with which this would be done.

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So it would appear that the CCIT was a convention introduced before its time. But by the time its time came, it was parallel to the dominant discourse. Parallel, but not necessarily divergent in its aims, as the next section explores.

THE TEXT OF THE CCIT

As mentioned earlier, the CCIT was originally proposed by India in 1996, at the 88th plenary meeting of the UNGA. As a result of this meeting, the UNGA passed Resolution 51/210, aimed at instituting measures to eliminate international terrorism. In it were appeals for international cooperation and a call for member states to ratify existing conventions on international terror. Of relevance to the CCIT is the concluding portion of Clause 9 of Part III which states:

...decides to establish an Ad Hoc Committee, open to all States Members of the United Nations or members of specialized agencies or of the International Atomic Energy Agency, to elaborate an international convention for the suppression of terrorist bombings and, subsequently, an international convention for the suppression of acts of nuclear terrorism, to supplement related existing international instruments, and thereafter to address means of further developing a comprehensive legal framework of conventions dealing with international terrorism;⁸

8. <http://legal.un.org/docs/?symbol=A/RES/51/210>. Accessed on January 2, 2017.

It was to be in this Ad Hoc Committee that the CCIT would be deliberated upon. The Ad-Hoc Committee has typically met once per year in since 1997. Most recently, the Ad-Hoc Committee met in December 2015 where it was resolved that more time would be needed to flesh out the CCIT. Part of the reason for such long drawn deliberations is the committee's decision that the convention not be adopted without full consensus. This, compounded by the complex subject matter of the convention itself, has, and continues to, obscure a clear path forward.

For the purposes of our analysis, we will refer to the latest iteration of the convention, first circulated in the 2013 report of the Ad-Hoc Committee. The convention remains much the same since its inception, however, there has been a degree of reordering, rewording, and additions to it over the years. After an analysis of the convention, as it stands, the value of these changes will be analysed.

So far, much has been said about the role definitions play in the discourse on terrorism, therefore, it seems right to begin the analysis of the convention with its definition of terrorism. Article 2 of the convention defines a terrorist as one who intentionally causes:

1. (a) ...death or serious bodily injury to any person...
(b) ...serious damage to public or private property...
(c) ...damage to property, places, facilities or systems referred to in paragraph 1 (b) of the present Article resulting or likely to result in major economic loss, ...
2. ... if that person makes a credible and serious threat to commit an offence as set forth in paragraph 1...
3. ... if that person attempts to commit an offence as set forth in paragraph 1...
4. ...any person also commits an offence if that person: (a) participates as an accomplice, (b) organizes or directs others, (c) contributes to the commission of one or more offences... by a group of persons acting with a common purpose. ..."⁹

9. <http://legal.un.org/docs/?symbol=A/68/37>. Accessed on January 2, 2017.

As can be seen from the definition clause, the scope of terrorist activity is broad but specific in identifying certain kinds of acts. Such a definition lends itself well to interpretation by state parties domestically. A wide array of criminal activity can now be defined as terrorist activity too. This, on the whole, is more a positive feature than a negative one, as it does not impose a view of terrorism on its members but rather allows for a coopting of multiple views.

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The convention does make clear that acts fitting this definition are unequivocally terrorist acts. as Article 7 specifies, no justification on the grounds of a “political, philosophical, ideological, racial, ethnic, religious”, etc. nature is permissible. The preamble clauses in the convention try and place this convention well within the existing counter-terrorism regime, but the convention does not necessarily try and establish a “normal” for what terrorism is. Also the nature of the acts laid down is such that were they committed within the domestic territory of any of the member states, they would attract criminal liability anyhow. These aspects bode well for how amenable the convention will be and give it a long lasting scope. This Article has on the whole been well received by state parties, with a few significant amendments suggested.

Article 3 has proved far more contentious than Article 2. Originally Article 18, it has been renumbered several times, it was last renumbered as Article 3 around 2010 by the committee to reflect its importance. Article 3 deals with the CCIT’s relation to international law at large. It originally stated:

1. Nothing in the present Convention shall affect other rights, obligations and responsibilities of States, peoples and individuals

under international law, in 17 A/59/894, particularly the purposes and principles of the Charter of the United Nations, and international humanitarian law.

2. The activities of armed forces during an armed conflict, as those terms are understood under international humanitarian law, which are governed by that law, are not governed by the present Convention.
3. The activities undertaken by the military forces of a State in the exercise of their official duties, inasmuch as they are governed by other rules of international law, are not governed by the present Convention.
4. Nothing in the present Article condones or makes lawful otherwise unlawful acts, nor precludes prosecution under other laws.¹⁰

Article 3 has been discussed in greater detail in a subsequent section of the paper. This has been done because the debates surrounding Article 3 have been considered by committee members as the major stumbling block, preventing the deliberations from moving forward.

The CCIT's role in harmonising the global counter-terrorism regime has been laid down in Article 6 which asks member countries:

- a. To establish as criminal offences under its domestic law, the offences set forth in Article 2 of the present Convention;
- b. To make these offences punishable by appropriate penalties which take into account the grave nature of these offences."¹¹

The Ad Hoc Committee has specified that the onus of the actual domestic enforcement of the CCIT will be on the states. Also as per Article 5, the CCIT does not apply in situations where an offence has been committed by a domestic actor within one's domestic territory. Such aspects are important to gather state support for such a convention, as instead of upending the framework within states, it allows it to be moulded in conformity to the CCIT, leaving enough room for state autonomy.

10. The Article in question is numbered Article 20 in this early document of the committee, <http://legal.un.org/docs/index.asp?symbol=A/59/894>. Accessed on January 2, 2017.

11. <http://legal.un.org/docs/?symbol=A/68/37>. Accessed on January 2, 2017.

The CCIT's prime focus does appear to be on fostering international cooperation in counter-terrorism efforts. The main "teeth" of the convention appear to be in its clauses on prosecution and possible extradition of actors that transcend borders.

The CCIT's prime focus does appear to be on fostering international cooperation in counter-terrorism efforts. The main "teeth" of the convention appear to be in its clauses on prosecution and possible extradition of actors who transcend borders. To that end, the convention gives member states a good amount of jurisdictional powers under Article 8 in situations where:

...1. (a) The offence is committed in the territory of that State...

(b) The offence is committed on board a vessel flying the flag of that State or an aircraft which is registered under the laws of that State...

2. (a) The offence is committed by a stateless person who has his or her habitual residence in the territory of that State...
- (b) The offence is committed wholly or partially outside its territory, if the effects of the conduct or its intended effects constitute or result in, within its territory, the commission of an offence set forth in Article 2...
- (c) The offence is committed against a national of that State....
- (d) The offence is committed against a State or government facility of that State abroad...
- (f) The offence is committed in an attempt to compel that State to do or to abstain from doing any act. ...¹²

In matters of a dispute between parties over who rightfully has jurisdiction, Clause 5 of Article 8 asks them to "coordinate their actions appropriately"¹³.

This is an aspect of the convention that is open to critique. In an apparent desire for a convention acceptable to all, its dispute resolution mechanism

12. Ibid.

13. Ibid.

is not particularly strong. Clause 5, Article 8 is just one example; Article 23 which deals with dispute resolution, in particular, is more telling.

For further disputes (not just jurisdictional ones) regarding the interpretation or application of the convention where such inter-state coordination is fruitless, Article 23 calls on them to move for arbitration. If arbitration proves fruitless as well, then they can then move to the International Court of Justice (ICJ). However, as is further laid down in Article 23, state parties can choose to opt out of this clause and thereby not have to submit to the ICJ at all.

Arbitration itself brings a host of problems, since the convention doesn't specify a manner in which arbitration should be carried out. In such a situation, the longstanding practice of how nations enter into arbitration will apply. Firstly, nations having a dispute would have to mutually agree to a seat of arbitration i.e. where the matter will be arbitrated. The seat of arbitration, in turn, decides what laws will apply. In certain cases, this may even involve a waiving of sovereign immunity. Though the clause allows for both arbitration and a move to the ICJ to be initiated by any one of the parties in the dispute, the fact that there is an opt out option greatly weakens it. Though such critique can apply to a vast majority of international laws and conventions, all of which lack the amount of enforceability domestically, this does not mitigate the critique.

Indeed, the aspect of cooperation in the CCIT is, at times, an issue, but, at other times, has the potential to yield great results. As can be seen in Article 10, state parties must take steps to prevent and counteract the following offences both within their territory and outside it:

1. (a) ...the illegal activities of persons, groups and organizations that encourage, instigate, organize, knowingly finance or engage in the commission of offences set forth in Article 2;

Arbitration itself brings a host of problems, since the convention doesn't specify a manner in which arbitration should be carried out. In such a situation, the longstanding practice of how nations enter into arbitration will apply.

If the CCIT comes into being, this clause will be particularly beneficial to India. India has long alleged that terrorist training camps within the Pakistani state have been used to train and equip actors carrying out terrorist activity in India. Such a clause will go a long way in setting a legal ground for the Pakistani state to dismantle such camps.

(b) In particular, measures to prohibit the establishment and operation of installations and training camps for the commission of offences set forth in Article 2.”

Such cooperation will be accomplished by – “... 2. (a) Establishing and maintaining channels of communication between their competent agencies and services to facilitate the secure and rapid exchange of information concerning all aspects of offences set forth in Article 2

(b) Cooperating with one another in conducting inquiries, with respect to the offences set forth in Article 2, concerning:

(i) the identity, whereabouts and activities of persons in respect of whom reasonable suspicion exists that they are involved in such offences; (ii) the movement of funds, property, equipment or other instrumentalities...¹⁴

If the CCIT comes into being, this clause will be particularly beneficial to India, that has long alleged that terrorist training camps within the Pakistani state have been used to train and equip actors carrying out terrorist activity in India. Such a clause will go a long way in setting a legal ground for the Pakistani state to dismantle such camps. While the Pakistani state has long denied any involvement with such camps, this clause says nothing of state involvement, merely that the very presence of such camps would now be in contravention to the convention.

Having fairly substantially covered the prosecution aspect of the convention as well as some the associated issues, the extradition aspect can now be delved into. Article 12, firstly, calls on member countries to initiate investigation if it comes to their attention that an offender, as defined under Article 2, is present in their territory. Then:

14. <http://legal.un.org/docs/?symbol=A/68/37>. Accessed on January 2, 2017.

2. Upon being satisfied that the circumstances so warrant, the State Party in whose territory the offender or alleged offender is present shall take the appropriate measures under its domestic law so as to ensure that person's presence for the purpose of prosecution or extradition¹⁵

Article 15 elaborates on extradition, stating that parties:

1. ...shall afford one another the greatest measure of assistance in connection with investigations or criminal or extradition proceedings brought in respect of the offences set forth in Article 2 of the present Convention, including assistance in obtaining evidence at their disposal necessary for the proceedings...¹⁶

The type of extradition envisaged is that for the purposes of counter-terrorism efforts, the CCIT specifies that extradition on the grounds of "race, religion, nationality, ethnic origin or political opinion," will not be entertained in Article 7. It would appear that the convention is trying to create an environment that could lend itself to the creation of a strong extradition and prosecution regime to tackle this longstanding issue in counter-terrorism efforts.

It is apparent there are some aspects of these key Articles that seem to work well and have the potential to lend themselves well to the international regime, while others are more problematic and prove to be stumbling blocks for progress with regard to the convention. To further analyse these aspects, one can refer to reports of the Ad-Hoc Committees and its Working Group. Doing so allows for greater clarity on aspects that have been touched upon in this section.

THE CONTEXT OF THE CCIT

From the use of the word 'comprehensive' in the title and the wide scope of the proposed Articles, it would be easy to overstate the role the CCIT

15. Ibid.

16. Ibid.

As a law enforcement instrument, it seeks to function within the existing international legal regimes: international human rights laws, the UN's own Charter, and a medley of international and national laws pertaining to security and terrorism.

intends to play in the global sphere. However, a reading of the reports of the Ad-Hoc Committee and its Working Group show that while the convention aims to have wide scope and applicability, it does not aim to be an overreaching instrument. It would appear that those steering the deliberations are aware that consensus for such a legislation is contingent on certain limitations that have to be clearly defined.

The first thing that subsequent committee reports have tried to make clear (through statements by the chairman and coordinators) is that the CCIT is entirely a law enforcement instrument. It is not a condemnation of terror or a declaration of principles pertaining to the fight against terror. As a law enforcement instrument, it seeks to function within the existing international legal regimes: international human rights laws, the UN's own Charter, and a medley of international and national laws pertaining to security and terrorism. This appears a sensible approach for such an ambitious convention—it would be somewhat unreasonable to think that a single convention could override an entire body of international law pertaining to terrorism that has been developing for decades (certain aspects for centuries). In line with the existing international regime is the CCIT's use of exclusionary clauses: simply put, if not expressly forbidden by the CCIT, nothing is in contravention of it. This committee acknowledged that such an approach had a precedent in previous anti-terror conventions like the Convention for the Suppression of Terrorist Bombings which it had played a role in shaping. In such an approach where there is a possibility of intersection between other laws and the CCIT, say, for example, laws pertaining to the actions of the armed forces, the already existing laws will apply.

Further clarifying its scope as a legal instrument, the CCIT is one aimed at establishing individual criminal liability premised on an 'extradite or prosecute regime'. This clarification became pertinent when the question of

state criminality and state sponsored terrorism came up around 2008 when, during the course of bilateral talks between certain member states and the coordinator, the question arose of what role the CCIT would play in situations where forces, under the direction of the state, acted in contravention to the CCIT, as well as in situations of state-sponsored terrorism. But again here, the coordinator chose to play a limiting role, citing that since the draft convention had been entirely premised on the individual, to then shift focus onto the state would result in a loss of consensus already gained. Further, the coordinator stated that such acts that involved the wrongful behaviour of states in perpetrating violence, were already governed by international law anyhow (citing the example of the United Nations Charter in this regard).

By 2009 (about 12 years into the deliberations), talks within the committee began on “managing expectations”. With longstanding areas of disagreement as well as the need to limit the ‘comprehensiveness’, two new developments occurred in the committee that are worthy of mention.

The first development regarding managing expectations was the suggestion that the convention be renamed as something that would lend itself to greater compromise and limitation. “United Nations Convention for International Cooperation in the Prevention and Suppression of International Terrorism” was one name that was suggested.¹⁷

The second suggestion focussed on aspects of counter-terrorism that the CCIT could not address. It was proposed that they be addressed in subsequent, separate conventions/instruments. An example was given of the ICJ judgement in the case of the Democratic Republic of the Congo vs Uganda, in which the court called on the states to “refrain from organizing, instigating, assisting or participating in acts of civil strife or terrorist acts in another State or acquiescing in organized activities within its territory directed towards the commission of such acts, when the acts involved a

17. Suggestion made on paragraph 22 on Page 4 of in the Report of the Ad-Hoc Committee 13th Session, available at <http://legal.un.org/docs/index.asp?symbol=A/C.6/64/SR.14>

Perhaps the greatest stumbling blocks of the past two decades have been the issues surrounding Article 3 (originally Article 18). This has been acknowledged by almost every single committee report as well as within the Ad-Hoc Committee over the past decade. Interestingly, Article 3 which, as stated earlier, deals with the CCIT's relations with the international regime, has attracted more contention and debate than the clause defining terror.

been acknowledged by almost every single committee report as well as within the Ad-Hoc Committee over the past decade. Interestingly, Article 3 which, as stated earlier, deals with the CCIT's relations with the international regime, has attracted more contention and debate than the clause defining terror. The most notable early contention comes from the Organisation of the Islamic Conference (OIC)—as early as 2001, the OIC had proposed a different draft version for Clause 2 of (then) Article 18. Where the original read:

threat or use of force"^{18,19}. This judgement could be the basis for another instrument particularly directed at the issue of state terrorism.

These need not be perceived as negative developments, as the convention still has immense potential as an instrument for extradition and prosecution, and its definition of terror could still go a long way in harmonising aspects of the international regime. What remains to be seen is whether in the attempt to move forward after almost two decades, the deliberators of the convention will open themselves up to too much dilution in favour of progress.

Perhaps the greatest stumbling blocks of the past two decades have been the issues surrounding Article 3 (originally Article 18). This has

18. Quoted from the "Declaration on Principles of International Law Concerning Friendly Relations and Cooperation Among States in Accordance with the Charter of the United Nations" of 1970 found, at <http://www.un-documents.net/a25r2625.htm>

19. Mentioned on paragraph 48 on page 11 on the Summary Record of the 14th Meeting, available at <http://legal.un.org/docs/index.asp?symbol=A/C.6/63/SR.14>

2. The activities of armed forces during an armed conflict, as those terms are understood under international humanitarian law, which are governed by that law, are not governed by the present Convention.²⁰

The OIC version read:

2. The activities of the parties during an armed conflict, including in situations of foreign occupation, as those terms are understood under international humanitarian law, which are governed by that law, are not governed by this Convention.²¹

The OIC's use of the word parties is to protect the actions of those persons it views as taking part in self-determination struggles the world over as in the case of Palestine and Kashmir. These situations involved many non-state parties, such as the Palestinian newspaper *Al-Quds* which the OIC was sympathetic towards.²² This suggestion to use the word parties opened a lasting debate. On one side were the nations that supported the OIC's view stating that as per international law (specifically, the Geneva Convention) the term 'parties to an armed conflict' was a well-used one. According to them, the scope for misuse of this clause was limited by this factor. Though it is worth noting that while 'parties to an armed conflict' has indeed been well used in Additional Protocol 1 of 1977 of the Geneva Convention, it has not been defined. While the context of its use and the situations where it applies may provide some clarity on it, this approach suggested by the OIC appears to fall short of providing a clear and unambiguous definition. The mention of "including situations of foreign occupation" seems to have been added by the OIC to highlight situations in which it felt the parties would

20. The Article in question is numbered Article 20 in this early document of the committee, <http://legal.un.org/docs/index.asp?symbol=A/59/894>. Accessed on January 20, 2017.

21. Mentioned in Annexe II of Ad Hoc Committee's report on its 16th Session, found at <http://legal.un.org/docs/index.asp?symbol=A/68/37>

22. Recent statements by the OIC that better elucidate this view can be found in the Tashkent Declaration of 2016, found at http://www.oic-oci.org/subweb/cfm/43/en/docs/fin/43cfm_dec_en.pdf and the reports of the OIC contact groups, found at http://www.oic-oci.org/topic/ampg.asp?t_id=11570&t_ref=4538&lan=en

The use of the term armed forces too opened the door to a series of questions, primarily those centred around how the convention would regulate the activities of the armed forces. However, as we have observed, the view that the convention would not override existing aspects of international law has clarified this to some extent.

need to be protected. However, the way the clause is worded, essentially means that it is intended to apply in all situations, and “including situations of foreign occupation” may also apply to situations of no foreign occupation and even situations of relative peace-time.

Further, in view of the CCIT being a legal document, one of the features of any good legal document is that it should have clear and well-defined clauses. While there will (and should) be scope for interpretation, definitiveness is largely considered a virtue. The opposing view was in line with this logic to a great extent, holding that the use of the word parties was too ambiguous and could actually give the colour of law to the activities of a bona fide terrorist. The use of the term armed forces too opened the door to a series of questions, primarily those centred around how the convention would regulate the activities of the armed forces. However, as we have observed, the view that the convention would not override existing aspects of international law has clarified this to some extent. It would appear that where the armed forces are concerned, the existing laws (either domestic laws or international ones like the Geneva Convention) related to their governance will apply.

In an attempt to balance out views and move forward, the coordinator submitted a version of Article 3 in 2007 that was hoped would be amenable to all. It made an addition to the fourth clause and added a fifth. The updated Article read:

4. Nothing in the present Article condones or makes lawful otherwise unlawful acts, nor precludes prosecution under other laws. Acts which would amount to an offence as defined in Article 2 of this Convention remain punishable under such laws.

5. This Convention is without prejudice to the rules of international law applicable in armed conflict, in particular those rules applicable to acts lawful under international humanitarian law.

The attempt here was to maintain the character of the convention as a supplement to international law as well as to close the door on the provision of legal sanction to activities that would in other circumstances contravene the convention. In that respect, this clause can be seen to be particularly successful. As early as 2007, this proposal garnered a modicum of support and it was suggested that this “breakthrough” development find its way in the *travaux préparatoires* of the CCIT. While this suggestion was fairly well received and commended within the committee, it did little to take the OIC proposal off the table—it would appear that this is the view that those steering the deliberations on the CCIT want it to adopt. In 2011, the chairman of the committee implored members to accept the coordinator’s suggestion and resolve the deadlock. This appeal has been repeated almost every year since.

CONCLUSION

As per UN Resolution 70/120, passed in 2015, the UN’s Sixth Committee decided once again that a working group be established to carry on deliberations. It does not require much deductive ability to predict that these deliberations too will be bogged down unless the debate around Article 3 is resolved.

While this is not the only debate surrounding the CCIT, and the OIC and the 2007 coordinator’s versions are far from being the only views on the matter, they do comprise a well-acknowledged part of the deadlock. If progress can be made in this regard, then perhaps, the CCIT has hope to see the light of day. For this to move forward, the most likely path forward would appear be that consensus be built for the 2007 coordinator’s version.

Given the emphatic appeals that have been made in this regard, it is an avenue that is already being actively pursued. Such a convention has the

It is one thing to deny extradition and prosecution in the current international set-up but, to deny (especially repeatedly) the same kind of assistance in a harmonised regime is an entirely different matter. The political ramifications of such contravention would be far greater in the latter case.

potential to drastically alter the extradition and prosecution regime (in many ways it seeks to create a regime of a scope not seen before), and perhaps for this reason, it might not be in the best interest of certain states that such a convention exists. Realistically, while this convention cannot compel states to cooperate in extradition and prosecution, it does at the very least act as a tool of moral suasion.

This is not an aspect to be regarded lightly. It is one thing to deny extradition and prosecution in the current international set-up but to deny (especially repeatedly) the same kind of assistance in a harmonised

regime is an entirely different matter. The political ramifications of such contravention would be far greater in the latter case.

Munna Jhingra, sitting in his cell in Thailand, has an equal shot at being extradited to India or his (allegedly) desired country, Pakistan. His fate remains largely unaffected by the CCIT and as far as people on India's extradition wish list go, Munna is perhaps not even the biggest fish either. But in the years to come, many such Munna's will pile up as they have continued to do over the past few decades, not just in India but the world over. From mere pawns of the masterminds in the global chess game of terror, such people will have a significant impact on our world. Failure to take legal action against such persons, merely as a result of a lack of consensus, will not just be a tragedy for the CCIT but for the world and the larger effort against global terror.



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