



# CENJOWS

## CONTOURS OF INTEGRATED AIR DEFENCE COMMAND

### (IADC): AN OVERVIEW

By

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#### Introduction

1. The battle for supremacy of the air has been a natural progression since the aircrafts became an integral part of war-fighting. As times and technology evolved, the concept of air warfare also changed with much greater integration of Land and Sea elements resulting the formulation of new doctrines. Use of air space by multiple users like Aircrafts, UAVs, RPAs, Drones, UCAVs, Hyper velocity vehicles, swarm attacks, stealth technology enabled aerial objects etc is giving rise to the philosophy of distributed operations in contested environments. Future wars will transit into the exospheric domain and space warfare, anti satellite warfare, use of the exosphere for launch and interception of flying objects, space based force multipliers in the C4I2 domain will be extensively employed. Use of AI, machine learning, quantum computing etc will forever transform the battlefield and the Armies across the globe are trying to evolve in order to use these emerging concepts most effectively. The countries which enable

their Armed Forces to transform and use these technologies will dominate the world in the future.

2. With the creation of CDS, the Govt has finally taken the much awaited decision to transform the Defence Forces. The decision to create Integrated Theatres and Joint Functional Commands based on the future threats faced by the country has already been announced by the CDS. Amongst these, the first one on the anvil is the IADC. This paper aims to navigate the evolution of the IADC to arrive at the present structures which exist in the country and further see the shortcomings of the present structures so as to arrive at the contours of the IADC which will be able to meet the emerging challenges of the future battlefield.

### **Preview**

3. The paper is laid out in the following parts:-

- (a) Part I: The evolution of Air Defence.
- (b) Part II: The present Air Defence concept and organization in India.
- (c) Part III: The shortcomings of the present structure and changes for future wars.
- (d) Part IV: The proposed organisation of the IADC.

### **Part I: The Evolution of Air Defence.**

4. The use of aircrafts in war-fighting commenced with the first World War, albeit at a very nascent stage. Nations realized the tremendous potential of the aerial medium in wars and a number of technological advancements in this field were witnessed which resulted in aircrafts becoming a battle winning factor by the time the World War II finished. As the use aircrafts grew in use in battlefield so did the need to counter these and this resulted in the creation of the Air Defence. In the initial years the main platform for countering this threat was by aircrafts itself and simple guns, however as technology improved and the ground based AD weapons evolved, the ranges, rate of fires, accuracy especially when guns were coupled with fire control radars, and the reaction speeds improved

manifold. The development of VSHORADs, MANPADS, self propelled gun missiles system, MRSAMs, LRSAMS, BMD etc have completely transformed the nature of battlefield. Advancement in the aircrafts was countered by the evolution of new concepts and technology in AD systems and vice versa and the battle between the aircraft and Air Defence became a technology driven race. This arena is constantly evolving and the future wars may well be fought in space and with remotely controlled aircrafts using AI and quantum computing with AD creating safe Zones with BMD, ASAT weapons and Lasers with highly accurate radars based both in ground and space. In this landscape it is important to understand the growth of Air Defence in India too so that we can evolve and improve the existing organizations to meet our future requirements.

5. It was during the World War II that Air Defence units were raised by the British to counter the Japanese air threat in SE Asia as part of the Anti-aircraft (AA) Batteries of Hongkong, Singapore Royal Artillery (HKSRA) and Indian Artillery. By 1940 The Indian Air Defence (AD) comprised 33 units organized into heavy and light anti aircraft (AA) batteries (bty). These units were equipped with 3-inch AA gun and later the 40mm L/60 gun. The heavy AA bty were used in the rear areas while the light AA bty were used for protection of army assets. These units and gave an excellent account of themselves during the war, however by the end of WW II a large number of these 33 units were disbanded and only four units remained of which, two each were given to India and Pakistan on partition.

6. The IAF was officially established on 8 October 1932 and it too evolved during the WWII and by the beginning of WWII an IAF Volunteer Reserve was raised to equip the proposed Coastal Defence Flights (CDFs). Five such flights were established at Madras, Bombay, Calcutta, Karachi and Cochin. A number of transformations occurred during the period of war till finally by the time of partition, the principal components of the RIAF were five Squadrons equipped with Tempest, Spitfires, C-47s and one Air Observation Flight. The IAF gave a stellar account of itself during all the operations that India fought, with the 1971 operations standing out as an exemplary feat of jointmanship by all the three services. This jointness, was however a product of the great leadership of the three services, their mature understanding of the needs of the day and was not an institutional part of the organization. The subsequent years witnessed joint operations ranging from OP PAWAN in Sri Lanka, OP MEGHDOOT in the icy heights of Siachen, OP CACTUS in Maldives, OP VIJAY in Kargil etc. Most of

these were executed with panache and skill and witnessed individual acts of bravery and brilliance, however the need of institutional reforms for true jointmanship came out loud and clear.

7. The Army Air Defence also performed exceedingly well in all operations, post independence and inducted new equipment and radars too. During the operations the two major tasks of the Air Defence were providing AD protection to the Airfields and to the important VA/VPs in the TBA. The AD protection of airfields was one of the major tasks of AD units and it still continues to be so. A large number of AD units performed brilliantly in their different roles and a number of enemy aircrafts were brought down while protecting strategic tasks, airfields and also forward troops. The Army AD and the IAF were jointly protecting the Indian skies and gave an excellent account of themselves in all these operations but all of this was not institutionalized. It was only in 1993 that the union war book endorsed the security of the Indian Airspace to the IAF.

8. Over these years both the IAF and the Army AD have inducted new equipment and the number of VA/VPs have increased manifold both in the TBA as also in the rear areas and strategic sphere. There is a demand and supply gap which necessitates detailed evaluation, prioritization before allocation of AD resources both of IAF and Army AD. Terminal AD protection in most cases is still provided by Guns which are essentially used only by the Army. Thus strategic tasks including Naval tasks onshore and Airfields continue to be provided AD protection by the Army.

## **Part II: The Present Air Defence Concept and Organization in India.**

9. AD operations are characterized by speed of reaction which, requiring excellent coordination between the resources deployed which involves surveillance radars, mobile observation posts, tactical radars close to the weapons, fire control radars controlling guns and missiles, aircrafts and other users of airspace. This makes clarity of situational awareness, quick decision making, speed in passage of info and decisions and robust communication over a large area a sine quo non. The observe, detect, track, engage and destroy loop is very short in an AD battle given the high speeds of aircrafts and coordination between resources is required over a large geographical area which is done through a Control and Reporting (C&R) System which is the backbone of any AD battle.

10. In order to carry out the tasks of Air Defence of the Indian airspace, the country has been divided into areas controlled by Air Defence Control Centre (ADCC). Each area is subdivided into smaller sectors which are controlled by Air Defence Direction Centre (ADDC). The ADDC is the executing agency for all AD battles in the country. Each ADDC has a few IACCS nodes (IAF) under command and these nodes are the hub of AD C&R. The Air and Ground Based AD Weapons (GBADW) are deployed in various VAs/VPs with the IAF and Army AD resources being controlled by their respective services less the strategic tasks for which resources are distributed centrally. A typical AD engagement would start by enemy aircrafts taking off from their bases. These would be detected by the AWACS, Aerostats, network of surveillance radars close to the IB, Mobile Observation Posts and forward troops as the enemy aircrafts approach closer. Our surveillance cover in the medium and high altitude is good but the same cannot be said of the low altitude coverage where challenges exist. The initial engagement would be at the greatest ranges by own aircrafts which would be scrambled from the nearest airbase to engage these enemy aircrafts as close or beyond the IB. These missions would be controlled by the IACCS nodes and the GBADWs in the vicinity would be told not to fire in order to avoid fratricide. Ideally the enemy mission would be destroyed by own aircrafts, however in wars, the ideal outcome may not emerge and plans for subsequent engagements are always prepared. The IAF visualizes the maximum threat to its bases, IACCS nodes and radars which are located in some depth inside the IB. The deployment of IAF weapons and nominated Army AD weapons on these assets caters for their survivability which is enhanced by the increased reaction time provided by the greater depth which allows successive engagements by aircrafts initially and thereafter by long range missile and subsequently by AD guns deployed in the vicinity. This allows different types of weapon systems to engage the enemy aircrafts at varied ranges, also called layered and tiered Air Defence. However, the luxury afforded by greater depth from the IB is not available to assets deployed closer to the IB, called the Tactical Battlefield Area (TBA), which includes the forward troops of both defensive and offensive formations along with their support echelons of firepower, C4I2SR and logistic elements which are normally located much closer to the IB. This creates the challenge of much lesser reaction time for engagement of enemy missions and need for having AD weapons in close proximity or affiliated alongside with fully enabled AD units and subunits capable of performing all functions of AD engagements independently. This situation is further aggravated by need for maneuver in battle causing

changes in affiliation / grouping and the attendant problems in mobile communications and passage of AD C&R inputs to all echelons in the fastest manner possible.

### **Part III : The Shortcomings of the Present Structure and Changes for Future Wars**

11. There are a number of areas where much integration has already been instituted, however the following short comings still require improvement:-

(a) Differing operational requirements of various stake holders and the lack of a common AD philosophy in the country is the main area which requires detailed deliberations. This is explained in detail in para 12.

(b) Air threat analysis requires to be done holistically for entire spectrum of operations by all stake holders in a combined manner which will obviate differing conceptual and operational philosophies.

(c) The resource utilization is done separately by the three services, less the Strategic assets. This doesn't allow optimum use of resources.

(d) **Communications**. All the three services are on different communication networks and softwares for AD C&R. The handshake between these different systems is not smooth and in a fast and fluid operation will not be sustainable. Hopefully with the rolling out of DCN the backbone would become common, however, the software should either be common or compatible with availability down to the lowest echelons. Integration of civil elements in the hinterland should be catered for.

(e) The protocols and procedure in operations needs to be made common for all operators irrespective of the service or organization. This can be achieved with common training and cross attachments.

(f) The areas of logistics, maintenance and procurement too lend themselves to considerable integration which can certainly be improved. Integration in these fields will assist in holistic capability

development and optimization of resources especially the limited budget available.

12. **Differing AD Philosophy of IAF and Army.** The differing operational needs of the IAF and the Army, wherein the IAF assets are at greater depths and are largely static vis-a-vis the Army assets which are closer to the IB are largely mobile, provides the backdrop to the differing concept and narratives of Air Defence of the two services which needs to be reconciled. The IAF prefers to work on a centralized mode of operation with the AD commander in the IAF command controlling the AD battle with three separate verticals of C&R, surveillance and weapons (Aircrafts and GBADW) which are integrated at the highest level i.e. IAF Command resulting in centralised use of all resources. The surveillance element, the GBADWs and Aircrafts and Control & Reporting Nodes are located at different places and under command different elements, however the inputs are available in real time through excellent communication backbone and dedicated software based solutions to the IACCS Node and the AD commander. The Airbases are the only exception to control by the IACCS nodes and within the defined AOR of the Airbase, also called Terminal Weapon Control Centre (TWCC), the weapons are controlled by the TWCC itself. All other areas in the AOR are controlled by the IACCS node and the AD commander centrally. This is premised on a static, stable and secure environment with some reaction time where unseen engagements will be the norm. While in the Army the philosophy is of decentralized deployment and execution. The AD units are normally subdivided into Batteries also called a fire units and each of these are equipped with the surveillance radars, C&R paraphernalia like command post and communications equipment and the weapons for destruction which could be a gun or missile. Thus each fire unit is equipped with the three verticals required for fighting the AD battle independently. These are connected with C&R nodes up the chain, i.e through ADOC (Regiment level), DADC (Armd Div level), JADC (Corps level). The IAF elements are co-opted at JADC and the IACCS picture is available there. Downwards transmission of inputs is through Army communication channels. These sequential nodes are required as communication ranges are limited and as the TBA expand in its operational envelop with troops movement, the control by one central authority, though desirable may not be feasible. These elements are mobile, albeit to varying degrees, depending on the affiliated formations need and are closely affiliated to formations in the TBA to cater for unpredictable nature of warfare accentuated by tenuous linkages which are

aggravated by maneuver, resulting in fluid situations with minimum reaction time. In such a scenario, seen engagements would be the norm and the need to have fully equipped fire units capable of independent operations alongside the fighting echelons can be well understood.

13. These two operational needs have emerged from operational experience of the two services over a period of time and will have to be factored in the IADC. The core competencies of the two services should be exploited. While doing so, it would be critical to examine the nature of future wars and the types of threats which will emerge. Based on this critical and holistic examination, both of the borders as also of the hinterland, the new organizations will have to be formulated not just in coordination between the three services but also with civil bodies like DGCA, AAI, Centre and State govts.

14. Based on the operational needs, the core competencies, future threats and technologies the area of Functional Integration (FI) will have to be identified and organizations created to optimize these. This will not only optimize the available resources but reduce the turbulence in restructuring. The following are some areas of FI which can be optimised:-

(a) **Air Intelligence**. This is an area where tremendous scope of coordination exists as interaction between various stakeholders is very limited. The IAF and Army which are closely associated with Air Defence talk differently as per their individual needs e.g the IAF talks of air campaigns in given time and space by enemy and own forces. The army talks of qualitative and quantitative threat and freedom of action in TBA under delegated execution by fire units which are primarily structured and organized as per the manifestation of air threat in the TBA with low level threat, short reaction time, uncertain and fluid environment being the main concern. These differing thought processes emanate from the need for freedom of action which all users desire whether it be the aircrafts or the GBADWS. These viewpoints on adversarial capabilities need to be viewed in the light of the latest concepts of use of hypersonic vehicles, advanced radars and computing aided by AI, drones, UAVs, swarm technology as seen in the attack on Saudi Arabian oil fields and the proliferation of these in the hinterland causing increasing security hazards inside the country in peacetime as well. The capabilities of our immediate neighbourhood and the larger landscape of the world and IOR region



should be reviewed and holistic threat assessment carried out. This should cater for short, medium and long term perspective and from this should flow our capability development needs, the organizational structure and philosophy for IADC.

(b) **AD Philosophy and CONOPS.** The AD philosophy and Concept of Operations for various theatres should be evolved based on the threat assessment as highlighted above. The differing needs of various organization will have to be factored and one size fit all approach needs to be avoided. The AD philosophy should factor all AD operations required for securing the Indian airspace bounded within the given land, air and sea boundaries. The execution of these operations will have to be carried out on ground by the Integrated Theatres and resources will have to be allocated for the same. This will be somewhat akin to the setup presently where the IAF is responsible for the security of the skies but the execution on ground is done by the Air Commands where the nominated AD commander prosecutes the AD battle in the local area. This structure however takes into account only IAF assets and nominated strategic assets. The other services deploy their resources as per their priorities; however the Operational control of C&R remains with the IAF (IACCS node). The philosophy has to now change to integrated planning, deployment of resources and execution with all elements now under command the AD commander at the Integrated Theatre, of course in full synergy with the neighbouring theatres, the IADC and other Govt agencies. We should pay increasing attention to assets in the hinterland in view of the emerging non-traditional threats and involve the civil organizations in a much greater manner in the AD philosophy.

(c) **C&R, Airspace Management and Communications.** This is the most critical area of AD battle and needs complete integration of the services and other stake holders. The present shortcomings as highlighted above need to be addressed and seamless integration between all users ushered in. This should be the first priority for execution by the IADC. Common Air picture, communications , software, procedure and protocols are a must.

(d) **Training, Manning, Logistics, Maintenance and Procurement.** Functional Integration in these spheres is the low

hanging fruit and should be one of the main areas of execution leading to much needed optimization of resources.

15. Delineation between the AD and Aerospace Command should be streamlined with clear and demarcated charters. The Aerospace Command should look after all airborne assets less those earmarked for AD role. It should also look at the Space segment where the future of war-fighting lies. The charter of the Aerospace command would thus include all aerial operations including out of area aerial missions, control of nominated satellites and anti-satellite warfare, hypersonic vehicles, UAVs, Hepr operations, strategic aerial missions, strategic lift capability, liaison with Govt on these issues etc. The perspective of the Aerospace Command will be in this larger context and this domain will become increasingly complex as India increases its reach to the regional sphere initially and later the global arena as an extension of its geopolitical stature in times to come. The IADC will operate in the smaller but equally vital area of security of the Indian Airspace within the given geographical boundaries. This division of charter is imperative because in future the security of airspace will become increasingly complex as the users of this space increase manifold requiring much greater civil-military and inter-service coordination. This will require a focused and dedicated organization comprising of specialists from all stake holders to work in unison. It should therefore be separated from the other aspects of air which the Aerospace Command would prosecute during war and peace.

16. The distribution of Air assets between the Aerospace Command, IADC and the Integrated Theatres has to be undertaken with clarity on the way future wars will be fought. This will be influenced by the requirement of high degree of specialization in differing domains of operations, the study of overlapping arenas and the need to optimize resources. Distribution of assets to the Theatres and Commands would certainly dissipate resources and when these are limited, this may cause concerns, however this should be seen in the long term perspective and the structural peculiarities of our system. Unity of command and availability of resources to achieve the desired aim by each Integrated Theatre must be catered for and structures created with this in view. The deficiencies in the holdings can be made up as the needs arise and this can be done in phases. In the interim inadequacy of resources should be made up by with flexible allocation based on emerging situations by IADC.

## **Part IV: The Proposed Organisation of the IADC**

17. Resource allocation based on visualised threats would flow from the IADC to the Integrated Theatres and other agencies. Central resources for strategic tasks should be retained under the IADC and reallocation of resources between the Theatres based on progress of operations should also be carried out by the IADC. The IADC would be headed by an Air Force officer initially with two deputies, one from Army and one from Navy. Subsequently these appointments could be on rotational basis. IADC would have linkages to the AD elements of the three services and the restructuring should align the IACCS AORs with the boundaries of the Integrated Theatre Commands. Certain recommendations for the staffing are as follows:-

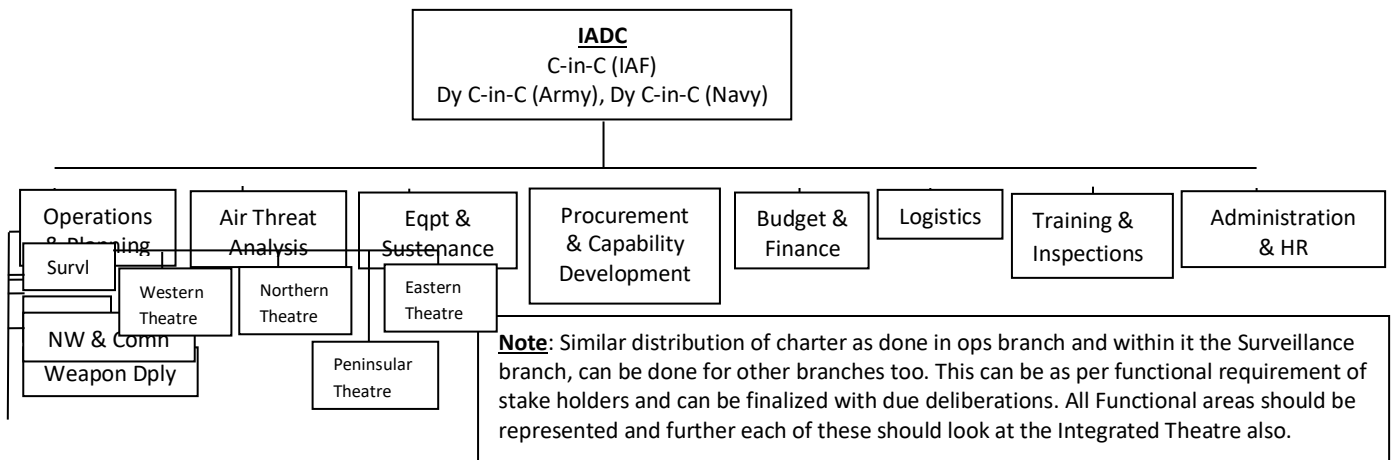
(a) The organisation within the IADC could be based on functional integration (FI) basis i.e Operations, Planning, C&R, Air Intelligence, Communication, Logistics, Maintenance, Budgeting, Training, Administration etc. Adequate representation of all services at various levels should be ensured.

(b) Training, logistics and maintenance should be under respective service HQ for administrative purposes. At mid and higher level, trg can be synergized jointly. These should operationally be echeloned from Tactical Battlefield Area (TBA) upwards and optimized at the theatre level.

(c) Procurements and capability development should be done through the Service Chiefs and CDS for optimizing the budget. This can be synergized based on inputs from IADC.

18. The future operational arena of IADC would witness much greater share of localized action as was seen post Balakote. Full scale wars are unlikely but localized actions as in Balakote, Doklam and other areas would be more of a norm and availability of resources within the Integrated Theatre for handling these will be critical as such actions would be unforeseen, time critical and highly contingent on speed of action lending itself to decentralized execution. Apart from such actions, operations in the hinterland shall also become critical in times to come as the UAV, drone and RPA threats will increasingly manifest themselves as part of non-traditional threat spectrum leading to higher states of readiness for longer

periods of time. Within their AOR, the Integrated Theatre Commands would be responsible for the security of Air Space. Resources of all the three services allotted to the theatre would be used in a seamless manner by the nominated AD Commander who would be responsible for the AD Battle within the theatre. The Integrated Theatres and formations under them should also have AD vertical, organized and staffed as in IADC which will ensure greater synergy. The IADC is recommended to be raised by HQ IDS as the task of this command will encompass not just the three services but also Central and Govt agencies, DGCA, AAI and other agencies like DAE, DRDO, CAPFs etc. HQ IDS is the only suitable existing Tri-Service organization which can deal appropriately with the multiple organizations which would be involved in the raising of the IADC and defining its charter. A proposed organizational structure of the IADC is given below.



## **Conclusion**

19. It is imperative that the IADC be formulated with due deliberations and the structures should be futuristic and long lasting. This is the first of the planned transformations and will therefore be a precursor of things to come. The underlying theme should always be the best means for provide National Security which remains main priority for the Defence Forces.

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