

# FORMULATING OF AN INTEGRATED AIR DEFENCE SYSTEM AS A RESPONSE TO CONTEMPORARY THREATS

N Karunaratne<sup>1</sup>, N Wanasinghe<sup>2</sup> and D Karunaratne<sup>2</sup>

<sup>1</sup>542 Brigade, Mannar

<sup>2</sup>No 5 Fighter Squadron, SLAF Katunayake

<sup>3</sup>Aircraft Engineering Wing, SLAF Katunayake

<sup>1</sup>nck66289@yahoo.com

**Abstract-** Air Defence (AD) is one of the prime security concerns in modern security concepts. With the rapid development in the field of military aviation, necessity of AD is becoming an important security arrangement worldwide. Different countries have developed some sophisticated weapon systems with associated command and control elements in order to encounter the threats from air. Sri Lanka, having an airspace which expands up to its Exclusive Economic Zone (EEZ) and beyond, is in a dilemma to safeguard it due to lack of resources and absence of proper vision. In order to encounter perceived threats which are mostly in asymmetrical nature, Sri Lanka is in need of an Integrated Air Defence System under unified command with decentralized assets. This paper intends to evaluate and analyse the current threats to Sri Lankan airspace in order to formulate necessary countermeasures. This is a study based on an empirical survey and data are gathered through primary and secondary sources. The authors also intend to introduce a structure for AD Command for optimal utilization of resources and authority to achieve synergetic effect.

**Keywords-** Air Defence, Integrated System, Contemporary Threats

## I. INTRODUCTION

Air Defence (AD) could be defined as measures designed to nullify or reduce the effectiveness of any attack done by hostile aircraft or guided missiles after they got airborne. It involves of nullifying or reducing the effectiveness of

attack done by hostile aircraft, missile or any other object of outer space. Air Defence system generally includes ground, air, surface and sub-surface weapon systems, associated sensor systems command and control methods and passive measures. It may be to protect vulnerable points (VP), vulnerable areas (VA), key points, and key areas which have economic, political, cultural and military potentials in a country. In its widest sense, air defence is the protection of VA of the homeland or VP against an enemy's air-attack. It comprises all operations which directly or indirectly afford such protection. The airborne threat is necessary to fulfil the Air Defence. (Unver, 2015) There is no any evidence for comprehensive AD system that has been employed to counter the threat from air until 1861. An American Aeronaut while on his balloon, reported the first anti-aircraft fire. Eventually this can be identified as a one of the pioneering attempts of any person in activating Air Defence. Ground based Air Defence Systems (Air Defence Artillery - ADA) began with its evolution when one of the US Army Officers built the first automatic AD weapon around 1909.

However, progresses in the field of AD Doctrine was apathetic as the military leaders were yet to realize the importance of air defence. The significant air threat encountered in World War I (WW I) triggered the development of dedicated ADA. Sound location and search lights were the main means of surveillance. The establishment of London Air Defence Area (LADA) in July 1917, was pivotal as it was the first step towards centralization & integration of assets like Field Firing units, Anti-Aircraft (AA) Gun Batteries & Search Light

Batteries into one entity (Prior, 2011). During the World War II (WW II) Air Defence Systems were developed rapidly and sophisticated systems were integrated with RADARs were introduced (Bullethead, 2011). It was Great Britain who pioneered the developing of integrated AD system with incorporated RADAR and AA gun systems during this period. (Werrel, 2005).

Air Defence Identification Zone (ADIZ) of Sri Lanka is defined up to 12 nautical miles from shore line. Responsible AD Commander has the sole authority to initiate relevant defensive and offensive actions against hostile aircraft or guided missile.

Further, according to United Nations Law of the Sea (UNCLOS), Sri Lanka has the right to challenge any hostile aircraft or guided missile when entering in to airspace over Sri Lanka's Exclusive Economic Zone (EEZ) (United Nations, 1982). However, with the available resources, it is a daunting task for responsible organizations to safeguard both these areas. Hence, we have to evaluate our actual requirement and acquire suitable air defence weapon system with land, surface and airborne units, which is to be placed under unified command to achieve optimum results. This paper discusses the requirement of such integrated Air defence System for island nation like Sri Lanka in order to counter the contemporary threats.

## II. THREAT PERCEPTION

The terrorist activities of Liberation Tigers of Tamil Eelam (LTTE) has come to an end in 2009 once Sri Lankan Armed Forces gained a decisive military victory. The last phase of the humanitarian operation reflected that the first ever terrorist organization in Sri Lanka flew their own aircraft. Despite its primitive nature, those aircraft delivered the intended terror among communities lived in non-operational areas especially in Colombo. It was Sri Lanka Air Force (SLAF) who shot down those aircraft in Colombo with an arduous effort with minimum resources available to them (Islamic Republic News Agency, 2009). Ever since, Sri Lankan airspace was not threatened by any mean owing to the peaceful environment prevailing in the country. Nonetheless, Colombo Flight Information Region (FIR) of Sri Lanka was trespassed in couple of occasions where AD net was alerted. In both the occasions they were high speed radar pickups which are suspected to be fighters. Hence, it is pertinent to understand the contemporary threats and challenges have to overcome on safeguarding our airspace.

### A. Local Threats

"A friend to all and enemy to none" is the catchphrase of Sri Lankan foreign policy. It means we do not intend to be enemy for any sovereign state but to be a friend. Our national interests and military objectives are formulated in accordance with our foreign policy. Hence, any military threat against Sri Lanka could rarely happen. There is a less probability of infiltration in to our airspace by a sovereign state as Sri Lanka maintains cordial relationships with other regional and extra regional states. However, due to the peculiar nature of contemporary threats, we must be prepared for any military threat with profound readiness. If the terrorists could penetrate one of the most sophisticated AD systems during 9/11 attack to Pentagon, an interested party will infiltrate comparatively frail Sri Lankan AD net. Hence, it is vital to study the types of threat that we might be facing in safeguarding our skies. Further, military intelligence had warned about possible subversion acts by unveiled extremist/terrorist groups.

### B. Regional Threats

Indian Ocean Region (IOR) sporadically has become a hot zone due to the fragile relationship between two nuclear powers India and Pakistan. Sri Lanka once allowed Pakistani military aircrafts to use base assets on their way during 1971 Indo-Pak war. India once intentionally violated Sri Lankan airspace during Operation Poomalai by using flying fighters and air-dropping supplies in North of the island in 1987. Hence, we must not consider Sri Lanka as an isolated Island and our airspace would be disturbed during an escalation between these two nations. On the other hand, number of extremist/terrorist groups have emerged within the region which could not be countered easily.

### C. Extra Regional

IOR is playing a pivotal role in the contemporary global politics. Western powers and emerging super powers like China can be identified as the most importance parties which intend to expand their presence in the Indian Ocean. Harsh V. Pant elaborated that the great game of this century will be occurred because of the waters of Indian Ocean. African and Asian continents are looking towards to establish their presence in the IOR through the Sea Lines of Communication (SLOC) and land routes as the China plays a massive role to secure their energy supplies.

Since Sri Lanka is geographically at the centre of IOR, the country has become a “super-connector” which connects East and West. Hence, Sri Lanka has been exposed to various traditional and non-traditional threats. In this backdrop we have to ensure the sovereignty and integrity of our airspace.

**D. Threat Evaluation**

Invention of the aircraft by Wright brothers changed the ways of future wars. However, it did not happen rapidly soon after they flew the first aircraft. It was Italian Army who began to use aircraft for military purpose in 1911. During the WW I this threat which came through the air was countered by using fighter and ADA. Since then AD systems evolved into various weapon systems, command and control elements, and sensor systems in order to detect Defended Areas (DAs). Within this context, threat Evaluation (TE) can be identified as the process of analysing and evaluating perceived threats in order to formulate necessary countermeasures.

**E. Actual Threats**

After the elimination of Liberation Tigers of Tamil Elam (LTTE) terrorists, now Sri Lanka enjoys peace and harmony across the island. During the final phase of the Humanitarian Operation conduct against terrorists, we encountered an air threat of terrorists owned light aircraft (Zlin 124) which became a threat to the security of Colombo city. With this understating, an interested party who would attempt to jeopardize the prevailing peaceful environment can be named as the root of the actual threats. Therefore, if the country failed implement a proper security measures, there will be a repetition of 9/11 attack which posed a great threat to security of Vulnerable Points (VP) and Vulnerable Areas (VA)s. It means Regional or extra-regional extremist/terrorists groups who are in possession of any kind of aircraft could enter in to our airspace and target country’s High Value Targets (HVTs) in order to bargain their demands. Further, Regional or extra-regional interested party can launch a short range or long range surface to Surface Missile (SSM) or Air to Surface Missile (ASM) being on land, naval or airborne platform.

**III. EXISTING ASSESSTS AND THE SYSTEM**

**A. Air Assets**

At present SLAF is the only service that has the air assets in very limited numbers. It possesses F-7 Fighter interceptors as their main weapon platform dedicated for AD. Apart from that, there are Kfir multirole fighter and K-8 advanced trainers which could be utilized against slow moving non-lethal air threats. K-8 was employed during the humanitarian operations for limited missions. However, present status of air assets is not in a satisfactory order to support materialization of the required depth of AD network.

**B. Land Based Assets**

These assets include the radars, weapon systems and command and control units. All Ground Control Interception (GCI) and surveillance radars deployed for AD requirements are under the control of SLAF. Also SLAF operates Air Defence Command and Control Center (ADC&CC) which commands and coordinates all SLAF AD units. It maintains certain degree of communication with Sri Lanka Navy (SLN), Sri Lanka Police and Civil Aviation Organization of Sri Lanka (CAASL) with related to AD matters. Further, SLN has maritime radars mounted at harbors and vessels for harbor protection. These radars are dedicated for maritime surveillance. However, performance of these radars enables primary detection of low level airborne elements. Apart from radars, both SLAF and SLN have different array of AD guns. Some guns such as L-70 are coupled with fire control radars which can be operated automatically. In addition, both SLAF and SLN have deployed IGLA shoulder fired missiles for the protection of VPs.

**C. Naval Assets**

All naval assets which related to the AD are in the hand of SLN. They have maritime radars fixed to navy vessels. Further, all vessels are mounted with multiple array of guns that are capable of taking airborne targets. SLN has not yet focused any significant attention towards maritime AD. As an island nation Sri Lanka needs a strong maritime AD measures to safeguard its territory surrounded by the Indian Ocean.

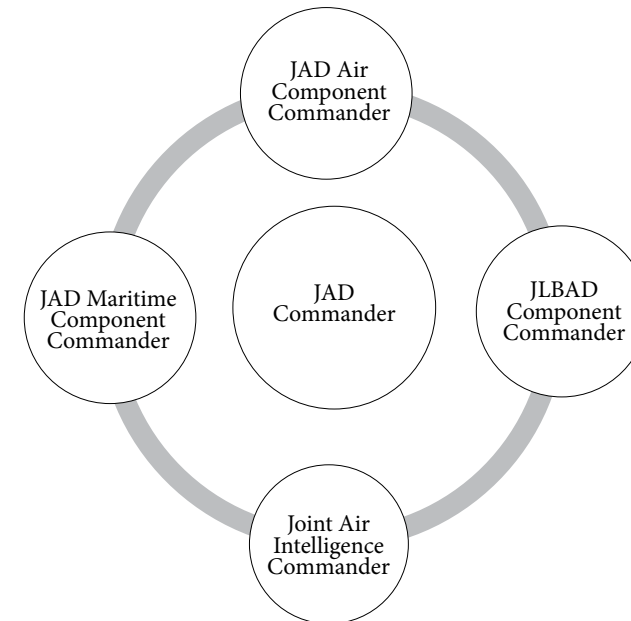


Figure 1. Proposed Command Structure of JADC & CC

Being the organization, whose primary role is AD, SLAF or any other air force is not in a position to mount a highly successful AD guard covering the whole spectrum. There is no argument that it needs the contribution of other civil organization to scrutinize the entire operation. At present above mentioned AD recourses are functioning quite independently without a proper coordination. The nature of AD operations is unique due to the very limited time left whenever AD is breached to react. Only an aggressively mounted AD set up would provide better results. Hijacked Airliner crashed to pentagon in parallel to 9/11 attack is a fine evident that proves how you may get fail even if you possess most sophisticated systems and resources. It demands highly rationalized system in order to satisfactorily counter AD threats. Equal contribution of early warning to Short Range Air Defence Systems (SHORADS) is a mandatory for implement a successful mission. Further, it requires a centralized and independent command for AD operations. Hence joint mechanism would serve better in this case where all required resources are readily available for disposal. However, considering the availability of assets and threat perception, a typical joint command would not be suitable for Sri Lankan context. Instead of that, a combination of required entities include certain join characteristics would be a better solution. Following is the basic command

structure proposed for the JAD Command and Control Center (JADC&CC) by the authors for the AD operations for the Island nation.

However, the duties of different components, departments and units needs to be performed by professionals to receive the expected outcomes. Following features are the main components / assets proposed under each commander.

- I. JAD Air Component Commander
  - a) All interceptor squadrons
  - b) All multirole fighter squadrons when deployed for AD purposes
  - c) All Early Warning (EW) platforms
  - d) All Surveillance and recce platforms
- II. Joint Land Based AD (JLBAD) Component Commander
  - a) All Radar squadrons
  - b) All LBAD weapon systems
  - c) All LBAD force protection units

The command and control of naval vessels with AD capabilities would be defined to serve AD and maritime defence. Nevertheless, a certain task would be expected when situation demands both services concurrently from such units. The understanding of the commander of the particular vessel regarding maritime and AD matters will play a key role in such cases.

- a) JAD Maritime component commander
- b) All harbor security units including radars at harbors
- c) All vessels with radars and AD capable weapon systems
- d) All coastguard units with AD capabilities

The Joint Air Intelligence Commander needs to have the close links with police, CAASL, sister intelligence services etc. Civil AD responsibilities would be looked after by this particular commander.

- I. Joint Air Intelligence Commander
  - a. Information collecting units
  - b. Information Analysis and Processing Unit
- ii. Information Archives

Within this situation, centralize command and decentralized execution are the basic concepts of command. Unity of command is one of the fundamentals of air power (Dupuy, 1955). In AD operations, unremitting vigilance and swift responses remains main factors of success. If these two are not met, the damage would be devastating. 9/11 attack on US and Operation "Opera" conducted by Israel Defence Forces on Osiraq nuclear reactor in Iraq in 1981 are classic examples for such incidents. Hence, it is of paramount that all AD executions comes under one single command for effectual and efficient operation. The central operation room must have all inputs of radars, Mobile Observation Points (MOP), air surveillance, Combat Air Patrols (CAP) and the processed and refined information of intelligence units.

#### IV. CHALLENGES AND RESPONSES

"Those who cannot remember the past are condemned to repeat it."

*-George Santayana-*

Most of the challenges which abridged below are been faced by ourselves or by other counterparts. If we do not hasten to respond those challenges, we will face the similar or worse consequences. Therefore, the authors urge the relevant entities to consider these response options for deliberation, which would be beneficial in formulating a deterrent AD system.

##### A. Acquisition and Maintenance of Assets

It is obvious that existing assets would not help in formulating the proposed integrated AD organization. Therefore, integrated AD system can be expanded and developed in to a network centric integrated system in order to fit in to the proposal of this study. It means it is necessary to acquire additional assets to mount an aggressive AD. Following are few main assets needs be procured to cater this proposal.

- a) 4th Gen or above multirole fighters
- b) Long range AD surveillance radar
- c) Short range Low level AD surveillance radars
- d) Maritime AD surveillance radars
- e) Surface to Air Guided Weapons (SAWG)
- f) Secure Data Link

In this scenario, the county has to develop necessary assets and capabilities. Even though it is quite challenging to convince the taxpaying citizenry and the governing bodies to fund, acquiring new assets and technology which usually cost in terms of millions of USDs is necessary to formulate a worthwhile AD set up. In addition, procurement of certain weapon platforms, weapon systems and other high tech military equipment should be monitored and influenced by interested state and non-state actors. Another challenge is the maintenance of acquired assets. But obsolescence, new acquisitions, change of strategies, change of command and cost factor, monopolistic nature of the industry and less number of units are the hindrances to achieve desired outcomes. So, establishing business partnerships with other organisations will lead to reduce the cost. When this comes to the technological aspect, the related technology needs to be gained in par with the acquisitioned assets.

Further modern day AD operations are so dynamic and ever transformative. Going parallel with the new

technology is not only a throbbing effort but also a costly affair. Developing nations like us might not have the luxury to enjoy the state-of-the-art techno at all times. However, the technology in hand needs to be reasonable enough to accommodate expected outcomes. One of the main fragments of this techno aspect is the network centric operation, which is the key of modern AD systems. During the humanitarian operations which were conducted against LTTE terrorists, SLAF developed a primary network centric AD system linked with Sri Lanka Army (SLA). On the other hand, Research and Development (R&D) is a better solution to acquire and develop new technology. It means, a separated R&D unit should be established. Total dependence on the other nations becomes questionable when politico-diplomatic calculus shifts between parties due to various reasons. Sri Lanka experienced such barricades from USA, Canada, members of EU etc during the final stage of war. The propaganda operations led by International Tamil Diaspora can be identified as the main reason for that. To avoid such barriers a certain degree of independent R&D unit is required. Above proposed modern and sophisticated systems should be aligned with the training modules to produce competent expertize. Usually the military related knowledge classifies as confidential due to the security sensitivity of the data, capability and capacity concerned. It is an obstacle to access required training requirements. Therefore, a clear vision requires to focus training set-ups to meet future requirements. When this comes to the aspect of air intelligence, it is well known fact that a proper air intelligence service provides earliest warning about possible AD threats. There are three factors need to be superimposed to activate a threat which are intent, opportunity and capability. Intelligence services can provide a clue on intent and capabilities of possible hostilities. Hence, the duty of air intelligence is to monitor trends of flying related activities and interest of suspected elements on the same. In this regard, the chain of command is the essential to manage personnel, units, regiments, divisions and all segments of forces. Though the three services have different sub cultures, traditions and norms in their respective services and units can blend them as an integrated system commanded by different force commanders. Such issues might affect the smoothness and operational effectiveness of the system. In that sense, an enhanced joint structure would not be a feasible solution for the county to exercise integrated AD system.

##### B. Non Traditional Threats

Most of these AD measurements have been designed to counter conventional threats. Unlike in past, nowadays the technology is easy accessible through the internet. Also the fantasy of flying has become a common dream of many communities. This has resulted to increase drone and model aircraft flying activities occurred for commercial purposes and recreation. These can be a better tool to satisfy hostile intents.

"It is better to be wise after the event than not wise at all, and wisdom after one event may lead to wisdom before another".

*-John C. Slessor -*

We have seen how commercial airliners were used as flying bombs by Al-Qaida's, (Zlin, 124). Actually it is questionable that these unorthodox threats could be successfully countered through neglecting AD measurements or not. Therefore, authors are in view that such threats can be explored through a separate study.

#### V. RECOMMENDATIONS

The recommendations are made by the authors to formulate an integrated network-centric AD system for the island nation as follows.

I. Establishment of separate R&D unit: It requires to establish separate R&D unit or section to deal with the AD matters. Then only we can manage the huge cost of existing system. Within this milieu, having a separate division to study traditional and non-additional threats related to AD would be beneficial in following aspects.

- a. Developing own weapon systems
- b. Maintaining of equipment and systems in hand
- c. Accessing and refining new technology
- d. Developing strategies, tactics and techniques for traditional and non-traditional threats

- II. Training for joint operations and technological advancements: Training set-up needs to be arranged in order to produce modern professionals who can easily fit in to integrated structures. Joint operation modules shall be included in the syllabi of all three services, advanced and continuation trainings. This would enable individuals to be acquainted with other services cultures, traditions, norms etc. At present Kothelawala Defence University produces officers for all three services who are been trained together. This kind of nature needs to be developed to gain proper outcomes. Further the syllabuses should be updated regularly in par with technological advancements. Further training which offered by overseas institutes will bring new knowledge for military personals.
- III. Establishment of proper Air Intelligence Unit: A proper functioning air intelligence service is a mandatory requirement for sound and alerted AD network. It is the only way to eliminate threats of hostilities. Hence an intelligence network which is interlinks with national interests needs to be formed step by step.

## VI. CONCLUSION

When it comes to AD, it demands quite large number of equipment, money and efforts to formulate an integrated system. Though a Building of an effective Air Defence system is a long term process, integration of the different elements is the best method to receive best outcome for an effective and aggressive AD network.

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## BIOGRAPHIES OF AUTHORS



**Major NC Karunarathne** joined the KDU as an Officer Cadet in year 2004. He obtained his Bachelor's degree in Management and Technical Sciences stream upon graduating. He has served in operational and nonoperational areas having commissioned as a Second Lieutenant to Sri Lanka Army in various capacities. He passed Defence Services Command and Staff College – Sri Lanka in year 2014 and earned his masters' degree in Defence and Strategic Studies from the KDU. He has completed his second staff course from Army Command and Staff College – Quetta, Pakistan and obtained a masters' degree in Art and Science of Warfare from National Defence University – Islamabad in year 2017. Presently he is discharging duties as a Brigade Major of an infantry brigade. His publications included Effective Employment of Civil Security Department Personnel in Sri Lanka and China- Sri Lanka relations in the Indian Ocean Region. His research interests are in the fields of Military Studies, Peace Studies, International Relations and Strategic Studies.



**Squadron Leader Dhananjaya Karunaratne** has joined Sri Lanka Air Force in year 2004 as an Officer Cadet to the General Sir John Kotelawala Defence University. He was commissioned in 2006 and he earned his BSc (Def Std) degree in Aeronautical Engineering in 2008. He started his career as an Engineer at the No 12 Attack Squadron and subsequently excelled as an Engineer on Bell Helicopters at the Aircraft Engineering Wing, No 4 Squadron and No 7 Squadron of Sri Lanka Air Force. At present he is serving as the Officer Commanding Special Projects at the Aircraft Engineering Wing which is located at Sri Lanka Air Force Base Katunayake. Currently He is reading for his Masters in university of Colombo