

Total Maritime Surveillance- An Integrated Approach

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Abstract—*The vision of the Sri Lanka Navy with regard to Maritime surveillance is to be able to detect, identify and classify all players in maritime domain within Sri Lanka's Exclusive Economic Zone. The major threats perceived in this area are human and arms smuggling, piracy, poaching, illegal migration and maritime terrorism.*

This paper proposes an integrated approach that aims to achieve the vision of total maritime surveillance using five distinct but integrated methodologies. They are Surveillance using Coastal sensors, Surveillance using fleet sensors, Human intelligence, Maritime intelligence (Commercial) and Through data from other government organizations such as SLAF, Police, Fisheries, Coast Guard, Customs, UDA, Survey department etc.

The comprehensive analysis on the capabilities, limitations and challenges in implementing these methodologies has been considered in the paper. The concept of total maritime surveillance can be formed on five pillars mentioned above, which need to be seamlessly integrated to ensure all maritime threats are fully detected, analyzed and classified so that a suitable response mechanism can be formed by the responding agencies that have the jurisdiction and responsibility at each unique scenario.

In conclusion paper will propose a joint operational structure that can be set up to ensure "Total Maritime Surveillance" in Sri Lanka by utilizing an integrated approach.

Keywords: Maritime Domain Awareness, Maritime Surveillance, Integrated approach

I. INTRODUCTION

The vision of Total Maritime surveillance is to be able to detect, identify and classify all players in maritime domain within Sri Lanka's Exclusive Economic Zone (EEZ). Due to the limitations in vast

resources required and scarcity of funds for achieving dominance in the entire EEZ, I would be delving into the surveillance within 24 NM from land in this paper. Threats perceived in this zone are human and arms smuggling, piracy, poaching, illegal migration and maritime terrorism.

The integrated approach discussed here aims to achieve total maritime surveillance in executing following five forms.

- Surveillance using Coastal sensors
- Surveillance using Fleet sensors
- Human intelligence
- Maritime intelligence
- Through data from other government organizations (such as SLAF, Police, Fisheries, Coast Guard, Customs, UDA, Survey department etc.)

II. SURVEILLANCE USING COASTAL SENSORS

The main resource of maritime surveillance is coastal sensors. The targets which can be identified are merchant traffic by radar and Automatic Identification System (AIS) and pleasure craft by day/night camera and satellite transponders, Non state actors such as illegal migrants, pirates, and terrorists by radar, Maritime Small Target Tracker (MSTT), Camera and Satellite based monitoring.

- Radar – All traffic
- AIS – Merchant vessels
- MSTT – Non state actors
- Day / Night Cameras – All traffic
- Satellite Transponders / Satellite based monitoring- Fisheries craft

A. Common Operating Picture

In order to effectively analyze and highlight suspicious activities, systems such as Common Operating Picture (COP) are utilized in advanced countries. For this system to be implemented in Sri Lanka Navy, it is required to complete coastal

microwave backbones and improve communication between sensor stations and Command Operations Rooms. A COP is made by integrating sensor data to form a maritime common operating picture which can be shared by NHQ, Command Headquarters and other stake holders at the same time (Fig.1).

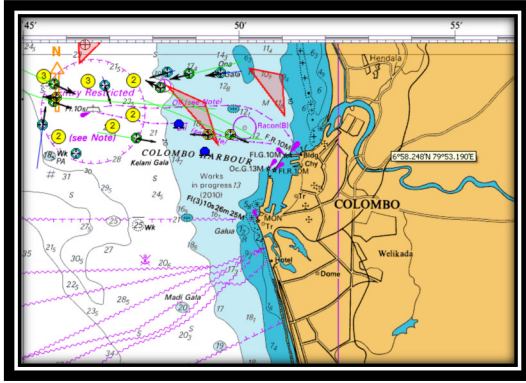


Figure 1 . Maritime Common Operating Picture

Due to the complexity of the system and the huge financial commitment involved, this project can be implemented with financial and technical assistance from interested countries with advanced technical capabilities such as USA, Australia and China.

Integration of sensors such as Radar, AIS and Electro optic surveillance system can be achieved using specialized hardware and software utilizing a map interface to geographically present the targets.

When all acquired targets are indicated in the real time using dedicated symbols these software are capable of Data Fusion and Anomaly detection thus enabling the operator to be alerted of the developing situation without having to physically monitor the screen continuously.

In order to transfer information gathered by coastal sensors to a command center, high bandwidth, reliable costal microwave backbones are required. Sri Lanka Navy has planned and executed North Western Costal Backbone (NWCB) from Colombo to Talaimannar, South Eastern Costal backbone (SECB) covering Panama, Oluvil, Hambanthota and Tangalle, North Central Coastal Backbone (NCCB) from Talaimanner to KKS, and North Eastern coastal backbone (NECB) from Trincomalee to Kankasanturai. South Western

Coastal Backbone (SWCB) from Colombo to Galle via Panadura, Kaluthara, Beruwala and Hikkaduwa is also proposed and once completed the network will cover the entire island coast (Fig.2).

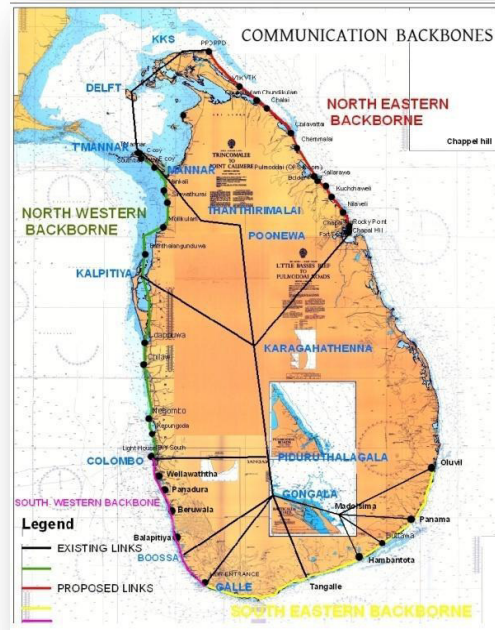


Figure 2 . Communication backbones around the coast

B. Improvements to sensor stations

It is important to improve sensor stations by replacing aging sensors used for more than five years and adding new sensor stations at South Western coast, South Eastern Coast and at gaps in other areas.

It is prudent to classify Major stations as "Naval Maritime Surveillance Stations (NMSS)" and minor ones as "Surveillance Sub Units (SSU)" and allocate resources according to optimize the operation.

Naval Maritime Surveillance stations shall have multiple radars, AIS, camera, 24/7 operation with capable Radar plotters, sensors are to be remotely monitored at command ops room, Air conditioned with continuous power and Lighting protection. Also they shall have direct communication access to the command ops room. And for surveillance sub units it is sufficient to have one radar, only dark hour operation and direct access to command ops room.

The purpose of having two levels of surveillance stations is to ensure optimum utilization of available resources both men and material, whereas the categorization shall be based on threat analysis on that particular area.

C. Improvement to Communication

The improvement to communication means of surveillance stations are achieved by ensuring secure RF communication between NMSS and COR by providing CDMA telephones and internal telephones from SLN Telecom Network and Data connectivity for internet, Intranet and Naval IT applications.

III. SURVEILLANCE USING FLEET UNITS

The second important aspect of total maritime surveillance is achieved using fleet units. Effective use of fleet units is mandatory considering the cost involved in sending a unit out to sea. Use of right surveillance pattern for the particular situation, use of onboard sensors to the maximum advantage, and concepts such as “on demand search coupled with continuous coastal surveillance” can be practiced at designated areas of responsibility.

A. Automatic Vessel Location System

Automatic Vessel Location System gives the much needed integration between fleet units around the island where a command console can connect ‘any to any’ vessel. Automatic vessel location system can be an effective tool in monitoring live deployment. Recording and playback facility can be used in many naval applications.

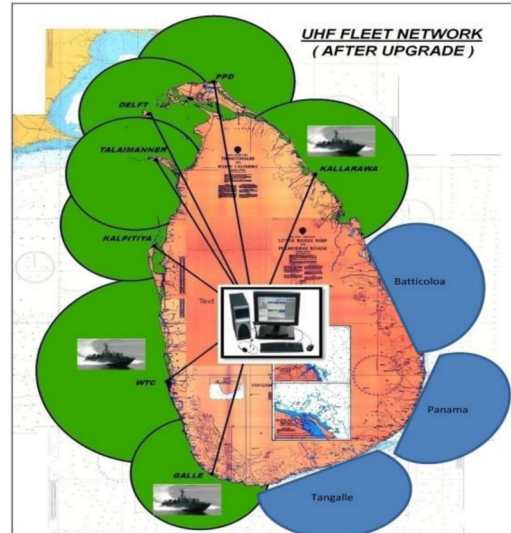


Figure 3. Automatic Vessel Tracking System

As per the map green areas are presently covered and the system and repeaters at Tangalla, Panama and Batticaloa are being upgraded to complete island wide coverage.

IV. HUMAN INTELLIGENCE

The third aspect of the total concept is the human intelligence. This can be derived from fishing community, local community, other intelligence organizations of Army, Air force, Police, and National intelligence agencies by way of meetings, conferences and correspondence. A national level intelligence sharing system can take the sharing of intelligence to the next level.

V. MARITIME INTELLIGENCE

The fourth aspect is Maritime intelligence, which can be achieved by various information systems such as AIS live where you get the path of a merchant vessel around the world, Lloyds Register online where you get all the data of a vessel with an IMO number, and various other internet resources. Information fusion centers such as the one in Singapore can be a major contributor in gathering essential maritime intelligence. Monitoring of terrestrial and satellite communication using ultra high cost equipment can yield many results at national level.

VI. OTHER GOVERNMENT AGENCIES

The fifth means to achieving total maritime surveillance is by gathering data from other government agencies such as SLAF with air reconnaissance Capability, Police with the wide reach and vast human resources, Fisheries department, Cost Guard, Customs, and survey department etc. This information is to be fused at NHQ level and fed to commands and surveillance stations for proactive surveillance operations.

VII. TOTAL MARITIME SURVEILLANCE

The concept of total maritime surveillance can be summed up by Fig. 4 where it shall be a continuous and inclusive cycle which integrates all possible aspects of achieving surveillance at all levels.

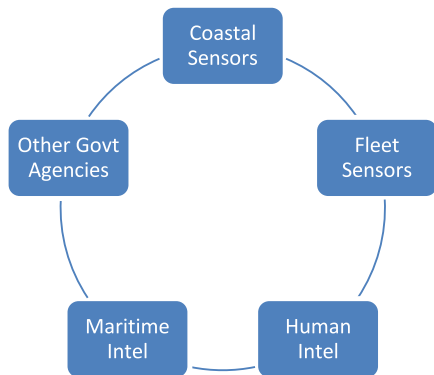


Figure 4. Five pillars of Total Maritime Surveillance

In conclusion it is emphasized the requirement of funds for the projects related to maritime surveillance and they shall be completed with an established time frame considering the national importance. It is required that five pillars of total maritime surveillance shall be fused using specialized software and applications developed to suit specific purposes at a special 'Maritime surveillance ops center' which can house the Maritime Common Operating Picture system at NHQ with dedicated staff from all stake holders of the maritime security sector.

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