

Role of Technology in Maintaining Coastal Security

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The infiltration of terrorists into Mumbai through the sea-route on 26 November 2008 exposed the vulnerabilities of India's sea coasts. It also signalled that India has not been sufficiently geared to contain such threats emanating from sea coasts. It has really been a challenging task for India to protect not only its land border but also its sea coasts and air space. The concept of India's border management has undergone a sea change with the growing vulnerability of the coastline and also of the airspace. It is most likely that the transgressor will always be on the lookout for soft gaps either on the land or along the coast and if need be from the air. It is important to protect India's long coastline for security reasons. Hence, it would be worthwhile to assess the relevance of technology in maintaining coastal security and see whether the technology alone can contain such threats. Undoubtedly, India's maritime boundaries have been prone to illegal cross border activities including smuggling of explosives and infiltration by terrorists.

The 26/11 event in 2008 has re-enforced the need for strengthening the maritime security set up to safeguard the nation against threats from the sea. The current Indian national security situation warrants to have a comprehensive approach to maritime counter terrorism covering the various dimensions of it including intelligence, collection, analysis, assessment, dissemination and final action and

implementation. What role technology would play in maintaining coastal security would form a major part of the debate and discussion. The maritime and coastal security in Indian context has certainly emerged as a problem of significant magnitude. It is anticipated that the surveillance technologies would appropriately address these emerging problems. The paper would highlight the role of sensors and surveillance systems in securing India's coastline. A modest attempt would be made to assess the various elements of Indian maritime security in the context of the nation's overall strategy to protect the public from terrorist attacks. How to improve the quality of existing radar network along the Indian coasts would be analysed in the context of India's articulation of maritime threats emanating from the 7516 kilometre long coastline spread across nine Indian states and four union territories. There is always a concern shown for the poor security and inadequate surveillance of India's long coastal stretch.

Threat Analysis from Sea Coast Point of View

Undoubtedly, the 26/11 event in 2008 in Mumbai revealed India's gaping holes in coastal security management. There is now considerable attention being paid by the Government of India to assess the threat situations and then articulate the technological requirements. The overall objective has been to protect the long sea coasts from the intruders and terrorists. The assessment of the technical feasibility of the relevant technologies would also be required to contain the unforeseen eventuality. There is certainly a need for better understanding of the nature and likelihood of potential terrorist attacks against India and how to protect or prevent such terrorists attacks in the first place itself through the help of technology has been a major area of concern and challenge in the current Indian coastal security environment.

The importance of the seas has been well recognised over the years and hence there is an urgent need to maintain stability and protect coastlines from the probable use by the non-state actors as a route or passage to reach to its identified destination. The 26/11 event has added an additional fear that sea routes could become safe haven for terrorists' activities in the foreseeable future. Hence, protection of sea coasts for such usage by the terrorists' groups has emerged as a great challenge for India. India has a total length of 7,516.6 km of coastline. There is certainly a growing concern about the safety and security of the overall Indian maritime environment. There is a significant amount of India's industrial and economic activity within 200 km of its 7,516 km long coastline. The existence of India's strategic technologies (nuclear weapons laboratories) within that range adds to the anxieties. Such threat analysis has been done to re-emphasise the vulnerability of India's coastal assets and an urgent requirement to adopt stringent mechanism to guard India's Coasts and provide adequate maritime security with the help of technology. The identification and application of relevant technologies would certainly help in containing the terrorists' threats emanating from sea coasts if not eliminating them completely. The basic thrust area and challenge has been to gather intelligence input with the help of technology. The other challenge has been to maintain surveillance across Indian coastlines with the help of technology.

Surveillance and Reconnaissance Capabilities

The concepts and the techniques of the surveillance and the reconnaissance have evolved primarily around technological advances worldwide in the areas of high-tech electronic devices, sensors and platforms. The revolution in military affairs (RMA) in the last couple of decades especially has impacted the national security apparatus and system. The developments in the field of computers, information

technology, processing and networking has impacted the way the information is collected, collated, disseminated and used in containing various other types of threats emanating from the non-state actors. The technological requirement in India has been to acquire the complete integration of the surveillance and reconnaissance information with the weapon systems to provide automated, precise and rapid offensive and defensive responses to nullify and restrict the enemy's hostile intentions.

It must be reiterated here that on matters relating to the maintenance of coastal security across Indian coastlines in the current regional and international security environment, the information dominance is the key. Information dominance may be defined as superiority in the generation, manipulation and use of information sufficient to afford its possessors military dominance through fast decisions and rapid responses and includes following three vital and important dimensions:

- 1 A sound and robust intelligence, surveillance and reconnaissance capability would be required for maintaining surveillance across Indian Coastlines. It would involve appropriate sensors and relevant technologies associated with intelligence collection, surveillance and reconnaissance.

- 2 A stringent and technologically sound Command and Control Centre, which would help in receiving, collating and disseminating the real time information for proper and effective implementation and action.

- 3 The use of sensors, improved communication systems, processing and use of data with the help of various identified technologies would help a significant improvement in the current scenario.

Sensors and Technological Development

The technological advancement has led to a significant improvement in detecting the opposing forces and their equipments, identify them and then accurate data on their

location. Such improvement in technology has helped in taking a decision in real time and contains or eliminates the emanating threats. If one can destroy every enemy one can see, then the key to solving the problems relating to coastal security would be to acquire information dominance. Earlier, the information collected from different sensors working in different domains with different frequencies were received and collated manually. Hence, it was taking lots of time in the use of information. The technological advances will now permit fusion of imagery and data from several different kinds of sensors such as infrared and other electronic intelligence sensors, in space, AWACS, UAV, ships and also in ground facilities as well as in the sea. The combination of various types of sensors, networks and various platforms used to collect information have been referred to as a "System of Systems."

The challenge in India has been the integration of the various elements of intelligence gathering systems, information processing systems and the integration of various platforms. It must be emphasized here that the integrated surveillance and monitoring systems are the key for achieving information dominance. The sensors for surveillance operating over wide spectrum of frequencies constitute by and large the integrated surveillance. The sensors can be broadly classified as image intelligence sensors, Signature intelligence sensors and Measurement and Signature intelligence (MASINT) sensors and non-imaging sensors.

There are a number of technology options available in the current scenario with regard to unattended ground sensor systems that sense movement of persons in their vicinity and signal an alarm. A sensor system can span distances from metres to theoretically thousands of kilometres. There are many technologies which can be used for sensing objects and movement in the sea. These include microphones, geophones (measuring soil vibration), infrared detectors, break-beam devices, cameras and radars. Some sensors make use of signals

emanating from the moving objects of detection themselves, while others need to emit energy and measure its return from the object. The Indian Coastlines would certainly require to use some of these very specific sensors to detect intruders. It must be reiterated here that the sensors without sufficient personnel support could produce a false sense of security. Sensor systems, thus, should not be seen as a personnel replacement tool, but rather as a highly important force multiplier.

Technological advances have enabled India to use airborne and space based sensors to check and contain infiltration through sea route. India would require expertise in data fusion. Fusion is the act of bringing together the wealth of data gathered from persistent surveillance and reconnaissance. It is a process of combining and transforming multi source data into intelligence necessary for decision making without degrading timeliness or creating information overload. The 26/11 event in 2008 in Mumbai took place because of the lack of expertise in data fusion. A number of information were available but were not channelised and acted at the real time despite the fact that sufficient information was available. The core concept is the combination and transformation of multi-source data into an integrated information product that is the creation of a single, integrated, interpreted and analysed intelligence picture from data supplied by various sensors and other technological sources. The quality and accuracy of the intelligence picture synergistically improves as data from additional sources is included. The concept of fusion must occur without degrading timeliness or creating information overload. In other words, when a user needs intelligence information, it should be made available in clear and concise form. The end result of the data fusion is to provide the decision makers an early warning of any intentions hostile to India's interests.

Satellite Based Surveillance Useful in Coastal Security

It is a well known fact that satellite – borne sensing devices can provide a regular and reliable means of updating information about the maintenance of coastal security in the overall national security architecture. Space provides a vantage point from which no area on earth is denied to the sensor system which can access large areas of over a short period. A space-based system can minimize the amount of atmosphere its signals must pass through by maximizing the grazing angles over which it deploys its sensors. Therefore it suffers virtually no shadowing effects due to mountains and thus acquires the capability to survey the overall territory.

Another factor in favour of space based sensor has been the cost. The cost required for producing and launching the sensors is moderate in comparison to large airborne surveillance platforms. The infrastructure cost of utilizing the space based sensor would also be less. The other important aspect to highlight is that the satellites are generally less vulnerable to attacks from ground or from air than static or airborne systems since the cost of developing and deploying anti-satellite weapons is high and so far only USA, former Soviet Union and China have the advanced technological capability to threaten such platforms. It must be highlighted here that the usefulness and importance of satellite based intelligence was realised to its fullest potential during the 1991 Gulf War. The satellites equipped with infra red sensors were able to locate most of Iraq's ballistic missile launchers and communicate it to the strike aircraft for subsequent neutralisation. India has the capability to use its satellites for surveillance purposes along the seacoasts.

Regular movement of satellites over India's coastlines can provide information required for the maintenance of coastal security. It would also help in the selection of coastlines for specific observations. Surveillance of the Sea from space can be achieved by placing the satellite in one of two types of orbits

namely geostationary orbit, which places the sensor at a fixed position, 36,000 km above the sea level or in Low Earth Orbit which has an altitude of about 700 kilometres and which would enable the satellite to rotate around the earth about every 90 minutes. The sensors placed on the satellites can include a wide range that operate at either optical, infrared or microwave wavelengths and can be either active or passive.

Optical surveillance, which can provide great details of the area under surveillance is limited to day light and cloud-free conditions. Infrared sensors play a vital role in military operations. It provides technical intelligence in addition to the detection of missile launches. The Space based Infrared System (SBIRS) includes a constellation of satellites in high and low altitude orbits. Microwave sensors would also be very useful for sea coasts monitoring. It helps in measuring the background and manmade radiation from the earth, oceans and atmosphere. Satellite based radars are synthetic aperture radars (SAR) and they provide all-weather day/night surveillance. In times of escalating tension, satellite-based SAR can provide early detection of any impending threat coming from within the areas under surveillance. In times of conflict, satellite based SAR can be used to plan and target attacks, to assess the extent of damage and also to determine any follow-up response. By having a SAR operating at metre wavelengths, foliage penetration would provide detection of activity underneath. Along Indian Coastlines, SAR can be used to detect maritime activity where even relatively small ships can be observed by means of the ship wake and the speed and direction can be determined. The SAR technology uses improved signal processing techniques with advance radar technology to achieve compact, low weight and high performing airborne sensors.

Non - Imaging Sensors

The most important non-imaging sensors are the radars. The radars with their capability to provide the information

about the targets from long ranges and in all the weather, day/night conditions have remained the sensor of utmost importance. A poor network of radars from Indian coastal security point of view requires a new look. The current advances the technologies specifically have made in the field of radars where a single radar can perform several tasks or functions simultaneously which otherwise would have needed several radars. There are also low level radars both mobile and fixed used for surveillance purposes. Indra and Rajendra, indigenously built radars are used for this purpose. Currently, most of the radars in all the platforms are gravitating towards the usage of active antenna array technology. Such usage provides the multifunction and multiple tasking of radars. It will have the low probability of intercept and will have the ability to be configured for wide variety of platforms for various roles. Another area of non-imaging sensors is the secondary surveillance radars. These radars primarily aid in the identification of a target as friend or foe. The network of secondary surveillance radar would certainly help in knowing whether the ship in the sea belongs to a friend or a foe. Such radars would boost the existing capabilities in terms of having a robust technological mechanism in maintaining coastal security and the Indian coastlines.

Conclusion

The infiltration of terrorists into Mumbai through sea route was well planned and executed. It exposed the gaping holes in India's coastal security management. The terrorists' involved in the execution of the plan signalled about their intent by attacking at five different locations in the financial and commercial capital of India. The question whether it could have been prevented in the first place itself is being debated. The event exposed the deficiencies, inadequacies and shortcomings in the overall coastal security mechanism. Is the technology solution? Yes, the technology has a dominant

role in averting a crisis of that sort but is not the only solution. The technology supplements and complements the overall security framework but the information provided has to be used in the real time to save from such disaster. Technology certainly would enhance and bolster Coastal Security. The current scenario requires a strong and robust network of Coastal radars in place. The concept of integrated surveillance requirements needs a great focus in Indian condition. The role of SIGINT, TECHINT, IMINT has to be enhanced to suit the Indian technological intelligence network. The hightech sensors and electronic devices would also help India in maintaining Coastal security. The role of technology in maintaining Coastal security will always be dominant and certainly not dormant.