

## MARITIME DOMAIN AWARENESS IN INDIA: SHIFTING PARADIGMS

*Captain Himadri Das*  
*30 September 2021*

### Introduction

Maritime Domain Awareness (MDA) has been defined by the International Maritime Organization (IMO) as “the effective understanding of any activity associated with the maritime environment that could impact upon the security, safety, economy or environment.”<sup>1</sup> The Indian Navy has described MDA as “an all-encompassing term that involves being cognisant of the position and intentions of all actors, whether own, hostile, or neutral, in all dimensions of a dynamic maritime environment, across the areas of interest.”<sup>2</sup> The *Indian Maritime Security Strategy* (2015) highlights that MDA is central to the Information–Decision–Action (IDA) cycle, and is also a key enabler for maritime security across the conflict spectrum. Amplifying further, the strategy highlights that the development of MDA relies upon multiple sources of information, including space, air, surface, underwater, cyber, human, their correlation, and constant assessment.<sup>3</sup> Broadly, MDA entails the collection, fusion, analysis, display and dissemination of actionable information and intelligence.<sup>4</sup> Dissemination of information is closely related to information sharing, which in turn supports domestic inter-agency and international coordination, as well as the development of MDA itself. A networked architecture is a prerequisite for effective MDA and information sharing.

In India, MDA can be deconstructed broadly into three categories depending on the actors and the nature of information involved: (i) military MDA, which is restricted to naval operations; (ii) non-military MDA, which includes all Indian maritime security agencies and sectors with a focus on security/constabulary functions; and (iii) information sharing mechanisms with navies, countries, regional constructs and other stakeholders. In 1996, the maiden attempt at an innovative solution to a networked naval force was made by a young naval officer, Lieutenant Commander (later Commodore) B.S. Ahluwalia – a naval pilot commanding a missile boat – who innovatively developed the Sangharsh (conflict/struggle) software as a “sensor grid

---

<sup>1</sup> IMO, “Amendments to the International Aeronautical and Maritime Search And Rescue (IAMSAR) Manual,” MSC.1/Circ.1415, 25 May 2012, <https://www.mardep.gov.hk/en/msnote/pdf/msin1242anx1.pdf>, accessed 29 June 2021.

<sup>2</sup> Indian Navy, *Ensuring Secure Seas: Indian Maritime Security Strategy* (New Delhi: Integrated Headquarters of Ministry of Defence (Navy), 2015), 165.

<sup>3</sup> Indian Navy, *Ensuring Secure Seas: Indian Maritime Security Strategy*, 165.

<sup>4</sup> United States (US) Government, *National Plan to Achieve Maritime Domain Awareness for the National Strategy for Maritime Security* (2005), p. ii. [https://www.dhs.gov/xlibrary/assets/HSPD\\_MDAPlan.pdf](https://www.dhs.gov/xlibrary/assets/HSPD_MDAPlan.pdf).

application”.<sup>5</sup> The software transformed the Indian Navy’s operational concept and was later developed into the Trigun (three dimensional) system for pan-navy application. However, for the next decade or so, the concept of a networked force which also facilitates the development of MDA largely remained a naval operational concept. It was only after the “26/11” incident that the concept was adapted for non-military applications, with a focus on strengthening coastal security in India, especially against the threat of maritime terrorism.

Some of the major decisions taken at that time for developing MDA were the setting up of a coastal radar chain by the Coast Guard, a National Automatic Identification System (NAIS) chain by the Directorate General of Lighthouses and Lightships (DGLL) and an integrated National Command, Control, Communication and Intelligence (NC3I) network by the Indian Navy. Earlier, in 2007, a Vessel and Air Traffic Management System (VATMS) had been operationalised in the western offshore development area by the Oil and Natural Gas Commission (ONGC), and in 2009, the Directorate General of Shipping (DG Shipping) had established Long-Range Identification and Tracking (LRIT) system in India in accordance with IMO requirements. These were subsequently complemented by the online registration and licensing portal for fishing craft, ReALCRaft, by the Department of Fisheries, and other initiatives, such as a tracking system for fishing vessels.<sup>6</sup> Some of the major milestones since “26/11” have been the operationalisation of the Information Management and Analysis Centre (IMAC) – the nodal centre of the NC3I Network – in 2014 and the Information Fusion Centre-Indian Ocean Region (IFC-IOR) in 2018 as MDA hubs for domestic and international information sharing. Earlier this year, DG Shipping announced its intention of establishing an MDA centre: Sagarmathan or the Mercantile Maritime Domain Awareness Centre (MM-DAC).<sup>7</sup>

The *Indian Maritime Security Strategy* emphasises on the pivotal role of the MDA across the Indian Navy’s constituent strategies, encompassing deterrence, conflict, shaping a favourable and positive maritime environment, coastal and offshore security, and force and capability development. In addition, the strategy emphasises on the need for multi-agency inputs for developing MDA; adoption of diverse approaches, including tactical, technical and procedural; capability development, including for surveillance, identification, information and communication technologies; development of regional MDA, etc.<sup>8</sup> In 2021, in a talk, the Chief of the Naval Staff (CNS) has also emphasised the need to build not only awareness but also a deeper understanding of the wider oceanic spaces, including through expanding the present domestic construct as part of a national project, and increased collaboration with foreign partners towards pooling information and making the “whole more than the sum of its parts”.<sup>9</sup>

<sup>5</sup> Anup Singh, *Blue Waters Abov! The Indian Navy 2001–2010* (New Delhi: Integrated Headquarters of Ministry of Defence (Navy), 2018), 307–08.

<sup>6</sup> See also Indian Navy, *Ensuring Secure Seas: Indian Maritime Security Strategy*, 104–25.

<sup>7</sup> Ministry of Shipping, “DG Shipping organises Road show and MoU signing ceremony,” Press Information Bureau, 27 February 2021. <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1701417>.

<sup>8</sup> Indian Navy, *Ensuring Secure Seas: Indian Maritime Security Strategy*, 55, 64, 95, 134.

<sup>9</sup> Admiral Karambir Singh, “Transforming the Indian Navy to be a Key Maritime Force in the Indo-Pacific,” Talk at the United Services Institution of India (USI), New Delhi, 27 August 2021. <https://www.youtube.com/watch?v=JliLaXx46AI>,

Some of the major plans and ongoing activities for further strengthening MDA include: the National Maritime Domain Awareness (NMDA) project; strengthening international information sharing through White Shipping Information Exchange (WSIE) agreements with friendly foreign countries; and establishing a constellation of satellites for MDA in the Indian Ocean Region (IOR) in collaboration with France. The NMDA project is intended to expand the scope of the NC3I network – which is presently limited to the Indian Navy and the Indian Coast Guard – by linking all maritime agencies, coastal states and union territories into one network, and also pooling data through interfaces with additional data sources, such as from the shipping and fisheries sectors.<sup>10</sup> Seven ministries, 15 agencies and 13 coastal states/union territories are likely to be integrated through the project.<sup>11</sup> India is pursuing WSIE agreements with 36 countries and three multinational constructs; and so far, it has signed agreements with 22 countries and one multinational construct.<sup>12</sup> In 2018, Indian Space Research Organisation (ISRO) concluded an Implementing Agreement with *Centre Nationale D'études Spatiales* (CNES), France, for pre-formulation studies of an MDA mission to provide an end-to-end solution for detection, identification and monitoring of vessels in regions of interest.<sup>13</sup> Subsequent media reports indicate that the joint mission envisages a constellation of satellites with telecommunications, radar and optical remote-sensing payloads.<sup>14</sup> The system is likely to be the first space-based system capable of “tracking ships continuously”.<sup>15</sup>

Globally, the ways and means to achieve the ends of MDA are witnessing change, and therefore there is a need for adaptive responses in India as well. This article endeavours to explore the shifting paradigms in MDA and information sharing with a focus on non-military MDA India, and the consequential imperatives.

## Shifting Paradigms

### *From Surface-based Sensors to Space-based Sensors*

India's non-military MDA architecture is predominantly based on surface sensors, such as coastal radars, and the NAIS chain, augmented by space-based inputs, such as from the LRIT system. In the past decade naval operations have been supported by satellite-based technologies. RESOURCESAT-2 satellite, which was launched in 2011, carried a commercial Automatic Identification System payload (AIS-SB) that relayed AIS information to the Indian Navy.<sup>16</sup> In

<sup>10</sup> Indian Navy, *Ensuring Secure Seas: Indian Maritime Security Strategy*, 167.

<sup>11</sup> Singh, “Transforming the Indian Navy to be a Key Maritime Force in the Indo-Pacific.”

<sup>12</sup> Dinakar Peri, “India Signs Shipping Information Exchange Pact,” *The Hindu*, 12 December 2018.

<https://www.thehindu.com/news/national/india-signs-shipping-information-exchange-pact/article25721408.ece>;

Lok Sabha, “Unstarred Question No. 4818: Vacant Posts in Navy,” 24 March 2021.

<http://loksabhaph.nic.in/Questions/QResult15.aspx?qref=23710&lsno=17>.

<sup>13</sup> Department of Space, “Cabinet Apprised of Implementing Arrangement between India and France on Cooperation on Maritime Awareness Mission,” Press Information Bureau, 27 June 2018.

<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1536708>.

<sup>14</sup> “Indo-French satellites to trace illegal spillage of oil by ships: French space agency,” *The Economic Times*, 4 October 2020. [https://economictimes.indiatimes.com/news/science/indo-french-satellites-to-trace-illegal-spillage-of-oil-by-ships-french-space-agency/articleshow/78476853.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/science/indo-french-satellites-to-trace-illegal-spillage-of-oil-by-ships-french-space-agency/articleshow/78476853.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst).

<sup>15</sup> “Indo-French satellites to trace illegal spillage of oil by ships: French space agency,” *The Economic Times*.

<sup>16</sup> Indian Navy, *Ensuring Secure Seas: Indian Maritime Security Strategy*, p. 161.

2013, GSAT-7 (Rukmini) was launched to support secure real-time communication between the deployed units of the Indian Navy in distant waters and its shore-based communication systems.<sup>17</sup> The Indian space programme has several satellites/payloads/ applications with possible utility in the maritime domain, including for maritime security and safety.<sup>18</sup> These include satellites/ payloads for imaging (CARTOSAT), synthetic aperture radar (SAR) imaging (RISAT), electronic/signal intelligence (EMISAT) and ocean colour monitoring (OCEANSAT), as well as space applications, such as the geospatial portal (Bhuvan).

The European Union's (EU) COPERNICUS space programme provides a number of services, including those focused on blue economy, climate change, security and emergency response.<sup>19</sup> Its maritime security services, using electro-optical (EO) and SAR observations, support border and maritime surveillance, fisheries control, law enforcement, marine environment pollution monitoring, etc.<sup>20</sup> Earlier this year, Canada launched a proof-of-concept international programme to detect and track "dark vessels" using a combination of government-owned and commercial satellites.<sup>21</sup> The system plans to use a mix of SAR imaging, electronic intelligence, ocean colour monitoring and a Visible Infrared Imaging Radiometer Suite (VIIRS).

There is little information about the use of Indian space-based capabilities specifically for developing MDA. However, it appears that the essential capabilities used by COPERNICUS and the Canadian programme are already available with the ISRO. Further, based on media reports, it also appears that similar approaches would be under consideration for the planned India–France MDA mission. In short, space-based technologies provide exciting opportunities for developing MDA and supporting maritime security, and ISRO's expertise must be leveraged for a holistic space-based MDA solution akin to similar projects elsewhere.

### ***From Single-dimensional to Multidimensional***

The traditional approach to MDA in India has largely been focused on understanding the 'surface' dimension of the maritime domain. However, as underscored in the *Indian Maritime Security Strategy*, MDA pertains to "all dimensions of a dynamic maritime environment", and therefore also includes both the sub-surface and the aerial dimensions. From a non-traditional maritime security perspective, semi-submersibles and submersibles have been used by criminal syndicates and terrorist organisations in different parts of the world, and there has also been intelligence in the past that the banned Jaish-e-Mohammad's (JeM) underwater wing was training

<sup>17</sup> "What is GSAT-7 Rukmini?," *The Indian Express*, 05 July 2017.

<https://indianexpress.com/article/what-is/india-rukmini-gsat-7-satellite-china-indian-ocean-region-sikkim-standoff-4736318/>.

<sup>18</sup> "EMISAT can bolster India's surgical strike capability," *The Economic Times*, 1 April 2019.

[https://economictimes.indiatimes.com/news/defence/emisat-can-bolster-indias-surgical-strike-capability/articleshow/68670153.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/defence/emisat-can-bolster-indias-surgical-strike-capability/articleshow/68670153.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst); ISRO, "RISAT-2BR1," <https://www.isro.gov.in/Spacecraft/risat-2br1>, accessed 29 June 2021.

<sup>19</sup> Copernicus, "Impact of Copernicus," <https://www.copernicus.eu/en/about-copernicus/impact-copernicus>, accessed 29 June 2021; Copernicus, "Copernicus Maritime Surveillance Service,"

<http://www.emsa.europa.eu/copernicus.html>, accessed 29 June 2021.

<sup>20</sup> Copernicus, "Security," <https://www.copernicus.eu/en/copernicus-services/security>, accessed 29 June 2021.

<sup>21</sup> Rafferty Baker, "Canada launching \$7M project to track international 'dark vessels' at sea," 24 February 2021, <https://www.cbc.ca/news/canada/british-columbia/dark-vessel-satellite-tracking-1.5927312>, accessed 29 June 2021.

terrorists for an underwater attack in India.<sup>22</sup> Considering the numerous challenges to develop wide-area Underwater Domain Awareness (UDA), so far, ‘point security’ measures to protect critical infrastructure through underwater sensors, like in the Integrated Underwater Harbour Defence and Surveillance System (IUHDSS), have been adopted.<sup>23</sup> However, with growing underwater threats to maritime security, both conventional and non-conventional, unquestionably there is a need to consider measures to progressively strengthen UDA. UDA has also been described as a key focus area of the Indian Navy.<sup>24</sup>

The recent attack on the Jammu air base in June 2021 and the attack on the *MT Mercer Street* off Oman in July 2021, using drones, also highlight the threat from the aerial dimension to coastal infrastructure and ships at sea. An Integrated Air Command and Control System (IACCS) of the Indian Air Force (IAF) is planned to integrate all ground and air sensors of the air force, army, naval and civilian agencies, thereby developing a composite understanding of the air situation, including in peninsular India and the Indian maritime zones.<sup>25</sup> Further, reportedly, the capabilities to detect small, slow, low flying drones are also under development.<sup>26</sup> Meanwhile, the Indian Navy has signed a contract with M/s Bharat Electronics Limited (BEL) for a comprehensive Naval Anti-Drone System (NADS).<sup>27</sup> The NADS, which employs radar, infrared (IR) sensors, and radio frequency (RF) detectors to detect and jam the micro drones, will provide “point security” to naval infrastructure and will also improve localised awareness.<sup>28</sup>

The maritime domain also includes the littoral areas, and therefore the MDA concept also entails understanding of the contiguous coastal areas. The Ministry of Home Affairs is pursuing the development of Comprehensive Integrated Border Management System (CIBMS) in stages. While the pilot project was completed in 2019, Stages II and III are planned to focus on deltaic and creek areas along the India–Bangladesh and India–Pakistan borders which are also contiguous to India’s maritime boundaries.<sup>29</sup>

<sup>22</sup> Shivani Sadanand Singh, “JeM’s underwater wing training men for attack?: Navy chief warns in Pune,” *Hindustan Times*, 22 June 2020, <https://www.hindustantimes.com/cities/jem-s-underwater-wing-training-men-for-attack-india-s-navy-chief/story-WWPDEM9hMJhpgwKbd0stTJ.html>.

<sup>23</sup> “Israel-designed harbour defence system unveiled,” *Deccan Chronicle*, 01 August 2015. <https://www.deccanchronicle.com/150801/nation-current-affairs/article/israel-designed-harbour-defence-system-unveiled>.

<sup>24</sup> Huma Siddiqui, “Underwater domain awareness main focus of the Indian Navy: Chief,” *Financial Express*, 03 December 2020. <https://www.financialexpress.com/defence/underwater-domain-awareness-main-focus-of-the-indian-navy-chief/2142665/>.

<sup>25</sup> “Government clears Rs 8000 crore IAF’s Integrated Air Command & Control System,” *The Economic Times*, 11 July 2018. [https://economictimes.indiatimes.com/news/defence/government-clears-rs-8000-crore-iafs-integrated-air-command-control-system/articleshow/49079201.cms?utm\\_source=contentofinterest&utm\\_medium=text&utm\\_campaign=cppst](https://economictimes.indiatimes.com/news/defence/government-clears-rs-8000-crore-iafs-integrated-air-command-control-system/articleshow/49079201.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst).

<sup>26</sup> R.K. Narang, “Counter Drone Systems: An Opportunity for Self-reliance,” Indian Foundation, <https://indiafoundation.in/articles-and-commentaries/coounter-drone-systems-an-opportunity-for-self-reliance/>.

<sup>27</sup> Ministry of Defence, “Boost to ‘Atmanirbhar Bharat’ in defence; Indian Navy signs contract with BEL for supply of Naval Anti drone system,” Press Information Bureau, 31 August 2019. <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1750830>.

<sup>28</sup> Ministry of Defence, “Boost to ‘Atmanirbhar Bharat’ in defence; Indian Navy signs contract with BEL for supply of Naval Anti drone system.”

<sup>29</sup> Ministry of Home Affairs, “Union Home Minister Launches Smart Fencing on Indo-Bangladesh Border, an Effective Deterrence against Illegal Infiltration,” Press Information Bureau, 5 March 2019. <https://pib.gov.in/Pressreleaseshare.aspx?PRID=1567516>.

Overall, MDA needs to adopt a multidimensional approach, by integrating, where possible, with other dedicated systems for surveillance and monitoring of the air, underwater and coastal dimensions. The degree and scope of integration with other systems will, however, need to depend on the nature of the MDA required.

### ***From Shipping to Fishing***

Subsequent to the “9/11” incident, measures to improve safety and security of merchant shipping included the mandatory implementation of the AIS and LRIT systems by the shipping industry. While compliance by vessels above 300 gross registered tonnage (GRT) engaged in international voyages (and certain other classes of vessels) is mandated by the IMO, such systems are not mandatory for other vessels. This complicates identification at sea, especially near coast where a larger number of smaller vessels also operate. Consequently, for tracking of vessels outside the purview of the international framework, such as coastal, fishing and inland vessels, there is a need to adopt customised local solutions. An indigenous solution for tracking vessels less than 20 m length has been developed by ISRO in association with the Indian Navy, is a possible implementable solution.<sup>30</sup> Towards promoting safety and security of fishers, under a central scheme, the PRADHAN MANTRI MATSYA SAMPADA YOJANA (PMMSY), assistance in the form of subsidies is being provided to encourage fishers to fit communication and other safety/ tracking devices onboard fishing vessels.<sup>31</sup> Unless suitable measures are implemented for the tracking of vessels of less than 20 m length, there will remain considerable challenges to MDA in India. As one of the largest exporters of fish and with increasing requirements to meet strict fisheries management standards for export, the need for a tracking system is not just a security imperative but also a developmental one.<sup>32</sup>

### ***From Network-based to Web-based***

MDA can be developed through a number of ways, including by participation of the wider maritime community, and is not limited to sensor-based means alone. Therefore, developing MDA capabilities requires the optimal mix of ways and means.<sup>33</sup> A number of Internet-based MDA and information-sharing tools, such as the IORIS, Mercury and SeaVision, have been adopted by several navies/countries/ regions.<sup>34</sup> The IFC-IOR itself uses the Merchant Ship Information System (MSIS) portal – again developed by a former naval officer, Commander

<sup>30</sup> Ministry of Home Affairs, *Annual Report 2019–20*, 44.

[https://www.mha.gov.in/sites/default/files/AnnualReport\\_19\\_20.pdf](https://www.mha.gov.in/sites/default/files/AnnualReport_19_20.pdf).

<sup>31</sup> Department of Fisheries (@FisheriesGoI), “Pradhan Mantri Matsya Sampada Yojana aims at providing safety & security during marine activities by assisting with communication and tracking devices such as VHF/DAT/NAVIC transponders for traditional and motorised fishing vessels”.

<https://twitter.com/FisheriesGoI/status/1429636239989248000/photo/1>

<sup>32</sup> “EU Carding Decisions,” IUU Watch, <https://www.iuuwatch.eu/map-of-eu-carding-decisions/>, accessed 6 September 2021.

<sup>33</sup> Safeseas *et al.*, *Mastering Maritime Security: Reflexive Capacity Building and the Western Indian Ocean Experience*, 21 February 2018, p. 14. <https://zenodo.org/record/1157961>.

<sup>34</sup> The “Indian Ocean Regional Information Sharing (IORIS) platform” is a Web-based maritime coordination and information-sharing tool developed by the EU CRIMARIO project (<https://www.crimario.eu/en/information-sharing/the-ioris-platform/>); “Mercury” is a tool for sharing information and the mechanism for responders to coordinate anti-piracy operations in the Gulf of Aden/Horn of Africa (<https://on-shore.mschoa.org/mschoa-and-maritime-domain-awareness-how/>); and “Sea Vision” is the US Department of Transport portal which provides a Web-based unclassified maritime information-sharing and management environment that enables users to share a broad array of unclassified maritime information to increase maritime security and build partnerships within the maritime community (<https://info.seavision.volpe.dot.gov/>).

Chaintanya Chandel – for developing a Common Operational Picture (COP) and for information exchange with partner countries and multinational agencies.<sup>35</sup> The NC3I Network, on the other hand, is an exclusive networked system connecting naval and coast guard nodes built in 2013-14 at a cost of about Rs 450 crore.<sup>36</sup>

Web-based tools offer an alternative and often low-cost approach to MDA and information sharing. Therefore, they do merit due consideration as a complementary measure for wider connectivity and deeper penetration, not just for international information sharing, but also for domestic MDA. Flyaway kits from proven systems abroad, or the indigenously developed MSIS, could potentially provide significant advantages for enhancing domestic inter-agency coordination pending the development of a national system. Further, the use of Web/mobile applications with value-added services to connect with the wider maritime community, as has been done by some navies, is another approach which merits consideration to consolidate further on the “eyes and ears” concept of community participation, and also to increase public awareness on maritime issues.

### ***From Decision Support to Artificial Intelligence (AI)***

In the early days of MDA when data was limited, operational teams would make sense of the data. However, with exponential increase in data, it is humanly impossible to fuse and analyse such large volumes of data. In 2019, the Indian Navy deliberated on the use of Artificial Intelligence (AI) and big data, during the Commanders’ Conference.<sup>37</sup> The navy is also integrating AI and big data analytics into the Trigun development programme with full integration planned by 2024.<sup>38</sup> In 2020, to reform defence research and development and boost innovation, the Ministry of Defence launched five labs with young scientists under 35 years of age, including one focused on AI.<sup>39</sup> With increasing volumes of data, decision support systems for MDA would need to be upgraded to comprehensively integrate AI and big data analytics for optimal utilisation, not just for military purposes but also in other categories of MDA.<sup>40</sup> Such systems would possibly also facilitate better anomaly detection and possibly even predictive analysis.

<sup>35</sup> Ajai Shukla, “To bolster security, Britain joins Indian Ocean monitoring hub in Gurgaon,” *Business Standard*, 23 June 2021. [https://www.business-standard.com/article/current-affairs/to-bolster-security-britain-joins-indian-ocean-monitoring-hub-in-gurgaon-121062300015\\_1.html](https://www.business-standard.com/article/current-affairs/to-bolster-security-britain-joins-indian-ocean-monitoring-hub-in-gurgaon-121062300015_1.html).

<sup>36</sup> Dinakar Peri, “IMAC will help Navy step up coastal surveillance,” *The Hindu*, 22 November 2014. <https://www.thehindu.com/news/national/imac-will-help-navy-step-up-coastal-surveillance/article6622612.ece>.

<sup>37</sup> Press Trust of India, “Three-day Naval Commanders Conference concludes,” *The Economic Times*, 25 October 2019. <https://economictimes.indiatimes.com/news/defence/three-day-naval-commanders-conference-concludes/articleshow/71751632.cms?from=mdr>;

<sup>38</sup> Mayank Singh, “New system with AI to boost maritime security,” *The New Indian Express*, 9 February 2020. <https://www.newindianexpress.com/thesundaystandard/2020/feb/09/new-system-with-ai-to-boost-maritime-security-2100873.html>.

<sup>39</sup> Ministry of Defence, “20 Reforms in 2020,” <https://www.mod.gov.in/sites/default/files/MoD2RE7621.pdf>, accessed 30 June 2021.

<sup>40</sup> Indian Navy, “Raksha Mantri Shri Manohar Parrikar Inaugurates IMAC, a Navy–CG Joint Operations Centre,” <https://www.indiannavy.nic.in/content/raksha-mantri-shri-manohar-parrikar-inaugurates-imac-navy-cg-joint-operations-centre>, accessed 29 June 2021.

### ***From White Shipping to Dark Shipping***

“White shipping” is widely understood to mean identifiable commercial shipping, while “dark ships” refer to ships/vessels that are unidentifiable (particularly those which have deliberately switched off identification systems especially for *mala fide* purposes). White shipping itself, depending on Port State Control (PSC) inspections, such as those by the Indian Ocean Memorandum of Understanding for PSC (IOMOU), can be further profiled and categorised into high, standard, or low risk ships.<sup>41</sup> The PSC agreements also promulgate lists of underperforming ships, ships on watchlist, and banned vessels. In addition to PSC, Regional Fisheries Management Organisations (RFMOs) also promulgate lists of fishing vessels presumed to have conducted illegal, unregulated and unreported (IUU) fishing, also known as the IUU list.<sup>42</sup> White shipping information therefore also needs to be correlated with other data sources for better profiling of possible threats to safety and security.

While India’s approach to information sharing has been focused on WSIE, India also has an agreement with the US on sharing maritime military intelligence, namely, the Maritime Information Sharing Technical Agreement (MISTA).<sup>43</sup> While sharing information on white shipping is a useful start and is an important tool in developing MDA, there is also a need to facilitate identification of dark shipping through innovative means, and progressively share such information with partners. Likewise, from a domestic perspective, the integration of intelligence efforts, largely focused on possible threats, is crucial for the success of the overall national MDA effort.

### ***From ‘Command and Control’ to ‘Cooperation and Collaboration’***

“Command and Control” is an enduring prerequisite for effective military operations. “Command and Control” has been defined as the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission.<sup>44</sup> In a contemporary context, especially in relation to cooperative efforts to counter non-traditional threats in the maritime domain, such as piracy off Somalia, informal coordinating arrangements amongst deployed task forces and independent deployers and other stakeholders, such as through the Mercury Net and Shared Awareness and Deconfliction (SHADE) forum, have proved to be effective. The *Indian Maritime Doctrine* (2015) lists “cooperation and synergy” as one of the principles of war and recognises that the principle is “also relevant in terms of coordination between various agencies of a Government dealing with national security and the conduct of war.”<sup>45</sup> It is widely recognised that a whole-of-government approach and robust

<sup>41</sup> Indian Ocean Memorandum of Understanding on Port State Control(IOMOU), “Ship Risk Profile,” <https://www.iomou.org/HOMEPAGE/srp.php?l1=6&l2=35>, accessed 21 September 2021; Indian Ocean MoU on Port State Control, “List of Banned Vessels by Member Authorities,” <https://www.iomou.org/HOMEPAGE/bannedPDF.php?target=blank>, accessed 30 June 2021.

<sup>42</sup> Indian Ocean Tuna Commission, “IOTC IUU List,” <https://www.iotc.org/iotc-iuu-list>, accessed 30 June 2021.

<sup>43</sup> Rajat Pandit, “India, US Gear Up to Share Maritime Military Intel,” *The Times of India*, 7 December 2020. <https://timesofindia.indiatimes.com/india/india-us-gear-up-to-share-maritime-military-intel/articleshow/79599263.cms>.

<sup>44</sup> DOD *Dictionary of Military and Associated Terms* (January 2021) s.v. “Command and Control.” <https://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/dictionary.pdf>.

<sup>45</sup> Indian Navy, *Indian Maritime Doctrine* (New Delhi: Integrated Headquarters of Ministry of Defence (Navy), 2009), updated online version 2015, 43. <https://www.indiannavy.nic.in/sites/default/files/Indian-Maritime-Doctrine-2009-Updated-12Feb16.pdf>.

inter-agency linkages are a *sine qua non* for effective maritime security, and consequently efforts at developing MDA, as a prerequisite and facilitator for maritime security, must be driven by a spirit of cooperation and collaboration to achieve common objectives based on mutual trust and sensitivity. Conversely, mistrust can hamper the development of MDA and the attainment of common objectives. Trust, a human factor, has been identified as both an outcome of and a precondition for successful MDA.<sup>46</sup>

### ***From Disaggregated to Aggregated***

As highlighted earlier, MDA in India can be deconstructed into three broad categories which meet specific MDA requirements. A ‘system-of-systems’, that aggregates information from multiple systems into one system, could facilitate an integrated approach to MDA. Further, with consideration of a Maritime Theatre Command (MTC), a proposed joint command, there is also a need for all agencies operating at sea, or in support of maritime forces at sea, to operate in a networked common information environment. Customised solutions may need to be developed for both integration of systems and integration of additional stakeholders within a joint operating environment.

### ***From “Make for India” to “Make for the World”***

Based on the pioneering work by Indian naval officers, and the active involvement of BEL in MDA projects, the approach to MDA in India has largely followed an indigenous model. The NC3I network and India’s coastal radar chain, the Coastal Surveillance Network (CSN), have been implemented by BEL with some foreign assistance.<sup>47</sup> India has also exported coastal radar systems to several countries, with more being planned in accordance with the Security and Growth for all in the Region (SAGAR) vision.<sup>48</sup> The Indian Navy’s Trigun system has been designed and developed indigenously by the Centre for Artificial Intelligence and Robotics (CAIR), under the Defence Research and Development Organisation.<sup>49</sup> In October 2020, the Minister of Shipping launched the development of an indigenous software for Vessel Traffic Service (VTS) by the National Technology Centre for Ports, Waterways and Coasts (NTCPWC) at Indian Institute of Technology (IIT) Madras.<sup>50</sup> As VTS systems can contribute to comprehensive MDA, the development of the system also has the potential to augment VTS integration into the NMDA/NC3I network. India, therefore, has developed the capability to not only make MDA systems for India but also develop such systems for friendly foreign countries. Indigenously developed MDA/VTS solutions could also support India’s contributions to initiatives such as the Indo-Pacific Oceans’ Initiative (IPOI).<sup>51</sup>

<sup>46</sup> Safe seas *et al.*, *Mastering Maritime Security: Reflexive Capacity Building and the Western Indian Ocean Experience*, 14.

<sup>47</sup> Dinakar Peri, “IMAC will help Navy step up coastal surveillance.”

<sup>48</sup> The coastal radar system in addition to radars also includes other sensors, such as the AIS, to facilitate development of MDA.

<sup>49</sup> Singh, “New system with AI to boost maritime security.”

<sup>50</sup> Ministry of Shipping, “Shri Mansukh Mandaviya launches ‘Development of Indigenous Software solution for VTS and VTMS’,” Press Information Bureau, 20 October 2020. <https://pib.gov.in/PressReleasePage.aspx?PRID=1666070>.

<sup>51</sup> Launched in 2019, the IPOI is an open global initiative that draws on existing regional cooperation architecture and mechanisms to focus on seven central pillars conceived around maritime security; maritime ecology; maritime resources; capacity building and resource sharing; disaster risk reduction and management; science, technology, and academic cooperation; and trade connectivity and maritime transport. See [https://mea.gov.in/Portal/ForeignRelation/Indo\\_Feb\\_07\\_2020.pdf](https://mea.gov.in/Portal/ForeignRelation/Indo_Feb_07_2020.pdf).

### ***From Local to Regional***

India formally developed a national system for MDA in 2014 with the inauguration of the IMAC, and swiftly moved up the ladder to establish the IFC-IOR in 2018. Progressively, over the last three years, the IFC-IOR has also inducted International Liaison Officers (ILOs) from several countries, along with establishing linkages with over 50 partners across the world, including from industry bodies and non-governmental organisations. As evinced from the monthly updates, the IFC-IOR monitors not just developments in the IOR but also certain areas beyond the IOR. Considering India's widening maritime interests across the globe, and particularly in the Indo-Pacific, the centre could progressively expand its linkages and coverage to possibly a global scale.

### ***From Informal Mechanisms to Formal Arrangements***

*De facto*, IMAC is the hub for NMDA in India and was established by the Indian Navy based on the Cabinet Committee on Security directives subsequent to the "26/11" incident. As India moves towards achieving NMDA, there is a need to establish the requisite governance structures to provide policy direction and practical guidance for sharing information and intelligence, and to align individual efforts with national MDA goals.<sup>52</sup> The governance architecture could include inter-ministerial/ interagency bodies at appropriate levels and necessary directives and guidance could take the forms of plans, strategies, Standard Operating Procedures (SOPs), protocols, MoUs, etc. Perhaps, these could in the long term also lead to the development of statutory provisions. Likewise, progressively, certain informal linkages for international information sharing could also to be formalised.

### **Conclusion**

In the 25 years since the concept of MDA was initially operationalised in the Indian Navy, its scope has progressively expanded, largely through indigenous developments, to cover wider geographical areas. In fact, it is now integral to India's maritime security and diplomatic efforts. Specifically, the initiatives taken subsequent to the "26/11" incident to strengthen MDA in India have been transformative. They have not only strengthened coastal and maritime security, their principal objective, but have also contributed in furthering India's foreign policy initiatives. Cooperation in MDA has been identified as a focus area by the Indian Navy, and a number of initiatives are planned to further strengthen MDA and information sharing. By itself, MDA may not prevent breaches of security or violations of law, but along with intelligence, it will remain a critical facilitator for the enduring requirement to understand the environment and for cuing effective operational actions. The ways and means to achieve MDA, driven substantially by technological developments, are evolving and the overarching imperative is to ensure that India's MDA capabilities continue to remain adaptive to emerging technologies and paradigms. India

---

<sup>52</sup> US Maritime Administration, "Maritime Domain Awareness Executive Steering Committee (MDA ESC)," <https://www.maritime.dot.gov/sites/marad.dot.gov/files/docs/ports/office-security/7941/mda-esc-2017-rev1.pdf>, accessed 30 June 2021.

has the necessary capabilities; the need is for a whole-of-government approach based on robust inter-agency linkages and a spirit of cooperation and collaboration.

***About the Author***

*Captain Himadri Das is a serving Indian naval officer and is presently a Senior Fellow at the National Maritime Foundation (NMF). The views expressed are those of the author and do not reflect the official position of the Government of India or the Indian Navy. He can be reached at [csmnda.nmf@gmail.com](mailto:csmnda.nmf@gmail.com).*