The use of space for maritime security in Europe

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The EU recently launched a reflection on a European Maritime Security Strategy. A most notable part of this effort was the report on Maritime surveillance in support of the Common Security and Defence Policy (CSDP) by the so-called Wise Pen Team in 2010-2011. The use of space in support of maritime security is a complex issue-area, at the crossing of maritime policy, security policy and space policy. The challenge is even bigger in Europe, as the EU is still in search of a coherent strategy in each of these three policy areas with numerous actors involved.

Until the middle of the 1990s, the EU did not have a strong interest for maritime issues, at least from a security perspective. This may seem paradoxical, given the importance of the maritime and coastal domains for the EU’s well-being and prosperity. They are indeed “Europe’s trade routes, climate regulators, sources of food, energy and resources”. Economically, the EU’s coastal regions account for more than 40% of its GDP while almost 90% of its foreign trade and 40% of its internal trade depend on maritime transport. This lack of interest was reversed after the end of the Cold War, with the evolution of the security environment and the development of the European Security and Defence Policy (ESDP). The relevance of the maritime domain both for external and border security became more evident for decision-makers.

While the use of space for security and defense is spreading, in particular with the growing number of national assets available, the relationship between maritime security and space remains in its infancy in Europe. Given the characteristics of satellites (potentially global coverage and continuity of observation) and recent EU policy developments in the field of maritime surveillance, the link between space and maritime security must now be emphasized.

To do so, we will define the concept of maritime security and identify the concrete role that space could play in it (1). The complexity of the European setting will be underlined, focusing on the political foundations, the multiplicity of actors involved and the efforts towards a more integrated maritime surveillance system (2). Finally, the international implications will be analyzed, as “maritime security is a global issue with a European dimension” (3).
Space and maritime security

What is maritime security?

After the Cold War, maritime security must be considered within a new security concept, one that has undergone a “double deterrioralization”. First, States are not the sole actors under threat anymore: individuals and societies inside the State, but also regional institutions or the whole international system outside the State face security challenges. Second, threats also come from non-State actors such as pirates, transnational terrorist groups or other criminal organizations. The very nature of the maritime domain – a space with a relative absence of legal constraints in the high seas – makes it difficult to control. As a consequence, it is a favorable milieu for the proliferation of “new threats”\(^\text{viii}\). These include piracy, terrorism, the proliferation of illegal weapons (including Weapons of Mass Destruction or WMD), organized crime, drug trafficking or illegal immigration.

Consequently, maritime security is “the combination of preventive and responsive measures to protect the maritime domain against threats and intentional unlawful acts”\(^\text{ix}\). The threats addressed by maritime security are all man-made. Concretely, maritime security encompasses three critical mission areas: the protection of ports (as critical infrastructures), of maritime transportation in the high seas and of coastal borders”\(^\text{x}\).

The most important step to achieve maritime security is to improve “maritime domain awareness” (MDA). MDA implies the “collection, fusion and dissemination of enormous quantities of data – intelligence and information […] to enrich a comprehensive common operating picture (COP)”\(^\text{xi}\). MDA is thus an enabler for other security measures, the ultimate goal being to identify threats early, and as distant as possible from the shores\(^\text{xii}\). The development of maritime surveillance capabilities is key to achieve MDA. It constitutes the data and information collection part of MDA.

In the European context, maritime surveillance is perceived as being dual-use by nature. Maritime stakeholders are indeed military actors (national navies, NATO), law enforcement communities (customs, coastguards) and civilian actors (commercial actors, International Maritime Organization (IMO), European Maritime Safety Agency (EMSA), national port authorities and ministries, fishermen, trading companies). A European integrated maritime surveillance would be a comprehensive framework comprising both security and safety elements (as opposed to security, maritime safety is directed towards “accidental or natural danger, harm, damage to environment”\(^\text{xiii}\)); border control, maritime pollution, marine environment, fisheries control, general law enforcement and defense\(^\text{xiv}\). A successful maritime security strategy should therefore rely on a coherent partnership between military and civilian actors\(^\text{xv}\).

Space and maritime surveillance

The collection of maritime information can be based on collaborative or non-collaborative tracking techniques, depending on the compliance of the tracked vessels with international requirements\(^\text{xvi}\). Space applications are helpful in both cases: by supporting and enhancing the capabilities of existing maritime surveillance tools (collaborative tracking) and by tracking non-collaborative vessels\(^\text{xvii}\).

Among the vast number of existing maritime surveillance systems, most of them rely already at least partly on satellite technologies. The capabilities of some others could be strongly enhanced by the use of space\(^\text{xviii}\). Worldwide, the most important system is the Long Range Identification and Tracking (LRIT) network set up by the IMO. It transmits information on ships’ positions through satellite telecommunications. Similarly, global emergency reporting systems such as GMDSS (Global Maritime Distress and Safety System), SSAS (Ship Security Alert System) or COSPAS-SARSAT are relayed by satellite technologies. In Europe, all the initiatives implemented by EMSA to supervise maritime safety and security and pollution prevention rely on satellite technologies. SafeSeaNet (SSN) is a “Europe-wide communication network based on Automatic Identification System (AIS) capable of detecting and tracking ships and obtaining information about their cargo”\(^\text{xix}\). While AIS is based on coastal facilities to receive and transmit information, the use of satellites is a promising option and could extend the availability of AIS data to the entire globe, and not only to coastal areas\(^\text{xx}\). SSN also uses satellite imaging
systems for ships not equipped with an AIS receiver. In addition, the Vessel Monitoring System (VMS) is used for fisheries monitoring and sends regular messages with vessel identification, time, position, course and speed. It uses both a GPS receiver for precise positioning and satellite communications to transmit the messages. Finally, the CleanSeaNet (CSN) initiative detects oil spills and fights marine pollution using satellites among other means.

Non-collaborative vessels can also be tracked using satellites. The most useful application here is Earth observation (EO), where optical and radar satellites are complementary. The former usually have a broader swath and a better resolution, but are blind at night and under clouds. The latter can overcome those two problems, but their resolution is usually mediocre, and they can be jammed. Finally, Signal Intelligence (SIGINT) satellites detect transmissions, such as mobile phone conversations, radio signals, or radar signals.

These applications are used in each of the three critical mission areas. First, EO satellites can both monitor port infrastructure and detect illicit traffic of radioactive material (in the case of a terrorist group trying to introduce a WMD through the maritime way for example). Satellite navigation is also helpful to ensure secure port navigation or to monitor container transportation. Second, EO satellites can detect threats in the high seas, including piracy and terrorist or trafficking activities. However, even by combining EO and radar capabilities, satellites have a mixed record of detecting ships, due mainly to identification problems (too low resolution) and long revisit times. As a consequence, it is necessary to combine satellite capabilities with other surveillance tools, such as maritime patrol planes, unmanned aerial vehicles (UAVs) or coastal detection systems. Satellites mainly indicate “where to look”, but threats have to be identified more precisely and confirmed by other means. Third, EO satellites, in particular radar sensors, are increasingly eyed to fulfill coastal surveillance missions. Besides EO applications, satellite navigation can also be helpful for maritime surveillance tasks, for the tracking of dangerous goods transported by sea for example.

The European setting

Despite the obvious potential of space applications to ensure maritime surveillance, space is not yet systematically integrated in the European policies on maritime security. In addition, the picture of maritime surveillance in Europe is still fragmented due to the large number of stakeholders. The main challenge for Europe is to create an integrated maritime surveillance system.

The political framework

Maritime security in Europe is at the intersection of three broad policy-areas: external security (i.e. the CSDP), internal security and space. The European Security Strategy (ESS) adopted in 2003 constitutes an important strategic framework for maritime security. It lays down a thorough threat analysis, emphasizing the interdependent character of a globalized world, and thus the emergence of new security threats. Almost all of these have a direct connection with the maritime domain: terrorism, proliferation of WMD, organized crime or State failure (one of the causes of piracy). Moreover, the ESS calls for increased security efforts at the EU’s borders and in its direct neighborhood, in particular in the Mediterranean basin. Space however is not mentioned as a tool to tackle these security challenges.

The EU also adopted an Internal Security Strategy (ISS) in 2010. The document recalls the strong interdependence between internal and external security. The internal security threats are indeed similar to the ones mentioned in the ESS: terrorism, organized crime, arms trafficking or trans-border crime. The strategy also calls for a proactive intelligence-led approach and for an integrated border management, two issues that clearly apply to maritime security. Space is being increasingly considered to implement the ISS, notably through the use of GNSS (GPS now and Galileo in the future) and GMES for transport security and of GMES for border management.

Finally, the European Space Policy adopted in 2007 also has a security dimension, although the use of space for maritime security was mentioned explicitly only very recently, in the 7th Space Council Resolution.

Two general points should be noted. First, space was for long not considered as an instrument for maritime security, but this started to evolve recently, with the launch of a number of initiatives...
aiming at increasing space capabilities for maritime surveillance at the European level. Second, military integration at the European level remains a challenging task. The CSDP indeed is still conceptualized as an ad hoc tool for crisis management, where it should be tailored for a more comprehensive approach of crisis prevention, especially at sea.\textsuperscript{xxvi}

A fragmented picture

The complexity and the transversal nature of maritime security explains the large number of actors. The first major obstacle is that maritime surveillance is strongly linked with national sovereignty, and is therefore mainly conducted at the national level. In addition, there is often a great number of bodies dealing with maritime security inside each member State (customs, border control, fisheries control, maritime safety, search and rescue, law enforcement etc.)\textsuperscript{xxvii}. Certain member States, such as Finland, France, Greece, Germany or the Netherlands, rationalized their maritime efforts by creating a single entity coordinating their national maritime policy\textsuperscript{xxviii}. Besides, a number of European institutions are involved in maritime security. The most relevant actors are the Commission (with DG “Maritime Affairs and Fisheries” (MARE) and DG “Mobility and Transport” (MOVE) among others), EMSA, the European Agency for the Management of Operational Cooperation at the External Borders (Frontex), the Joint Research Centre (JRC), the European Defence Agency (EDA), the EU Military Committee (EUMC) and the European External Action Service (EEAS).

Diverse initiatives using space for maritime security were therefore launched both at the national and at the EU level. From an operational point of view, radar imagery is already being used for maritime surveillance by Germany (TerraSAR X) and Italy (Cosmo-Skymed constellation). The French company SpotImage is using optical imagery for the same purpose. At the R\&D level, several national projects focusing on space and maritime security were launched. The French Galileocean for example, aims at optimizing Galileo for maritime positioning. Similarly, Germany launched the ShipDetec project, combining radar imagery with AIS data to detect piracy, illegal immigration and illegal fishing, or the DEKO project, combining optical and radar imagery for maritime surveillance\textsuperscript{xxix}.

At the European level, the most visible space-related initiative in the field of maritime security is the EU Satellite Centre (EUSC) in support of the EU anti-piracy mission Atalanta (EU NAVFOR). This CSDP mission was launched in December 2008 and extended to December 2012 to counter pirate activities off the Somali coast. EUSC is providing the EU NAVFOR operational headquarters with imagery intelligence reports. They focus on the observation of known pirate operating bases, the search for potential pirate bases, the monitoring of military activities at the Somali borders and of skiff activities\textsuperscript{xxx}. In this perspective, EMSA engaged two pilot projects (PIRASAT 1 and 2) to provide Atalanta with the best possible surface picture.

Two other projects are important for the future of space-based maritime surveillance. The first one is GMES, which will significantly contribute to maritime surveillance through the Marine Core Service. Specifically, GMES will be used for tracking vessels on the high seas, punctually monitoring selected neighboring countries’ ports and coasts and monitoring external borders\textsuperscript{xxxi}. This corresponds to the three critical mission areas of maritime security. The second one is the use of satellites for the transmission of AIS data (SAT-AIS). ESA is currently conducting studies to define the design of a suitable European SAT-AIS. A SAT-AIS receiver piggy-backing on the European International Space Station (ISS) module Columbus already provides first operational services, even if the low revisit time doesn’t allow for a precise monitoring. ESA is working closely with industrial partners (OHB) and with EMSA to develop this system further\textsuperscript{xxxii}. Finally, a number of FP7 projects are currently exploring the concrete potential of space for maritime security. DG MARE is also supporting pilot projects, most notably BlueMassMed, focusing on the Mediterranean basin, and MARSUNO in the northern region of European maritime surveillance\textsuperscript{xxxiii}.

Towards an integrated maritime surveillance architecture

Challenges here include the numerous decision-makers and the lack of coordination between them, but most of all the lack of political will by national actors to share their maritime surveillance data. The EU tries to fix it by setting up an integrated maritime surveillance architecture. The first step in this direction was the adoption of the Integrated Maritime Policy (IMP) in 2007\textsuperscript{xxxiv}. The goal of the IMP is not to create an additional surveillance system, but
rather to integrate existing systems and to enhance the coordination among member States and with the appropriate agencies.

The EU is setting up a Common Information Sharing Environment (CISE)\(^{xxxv}\) in order to share maritime surveillance information between all operational users and thus to implement maritime surveillance concretely. A CISE will ensure the interoperability of existing systems, avoid duplications in the collection of information and according to the principle of subsidiarity, let member States carry out the vast majority of surveillance activities and space could play an important role in the collection of data.

The international dimension of maritime security

The development of effective and integrated European maritime surveillance capabilities will strengthen Europe’s autonomy and support its growing ambitions as an international actor. At the same time however, transnational threats that no actor can deal with alone are rising in the global maritime domain. This dilemma (autonomy vs. interdependence) is particularly acute in the case of EU-NATO relations in the field of maritime security.

NATO indeed has shown increasing interest for maritime issues\(^{xxxvi}\), and released a new Alliance Maritime Strategy in the beginning of 2011. In the field of maritime surveillance, NATO uses AIS data to feed its Maritime Safety and Security Information System (MSSIS). While it is aiming for global coverage, it is most advanced in the Mediterranean Sea. Thus, it would seem rational to integrate NATO capabilities within the European architecture for maritime surveillance in the long run. Both the Chiefs of the European Navies and the Wise Pen Team called for such a solution\(^{xxxvii}\). It seems wise however, to first consolidate integration on maritime security at the EU level before moving ahead with NATO-EU cooperation.

More generally, there are a number of ongoing initiatives trying to push for the creation of a global maritime awareness architecture. The Collaboration in Space for International Global Maritime Awareness (C-SIGMA) is one of these. It calls for the development of shared surveillance assets that could provide a universal common operational picture. Such a “system-of-systems” could encompass classified (military) space assets, but given the limitations associated with their use (limited number and limited availability), priority should be given to commercial assets\(^{xxxviii}\). Another project is the Global Awareness Data Extraction International Satellite (GLADIS) constellation. The concept rests on a constellation of 30 polar-orbiting satellites which would collect and disseminate AIS data freely among all participants\(^{xxxix}\).

Regardless of these initiatives, the EU already indicated that the improvement of maritime safety and security is among the external priorities of the IMP. The EU will seek regular discussions with partners interested in an integrated maritime approach (such as Norway, Canada, the US, Japan or Australia), but also with other actors such as Brazil, China, India or Russia\(^{xl}\). Indeed the EU needs their help to complement its coverage of far off areas\(^{xli}\). Finally, this approach is in line with the EU’s international strategy, focusing on multilateralism to handle transnational issues.

Conclusion

The EU recently showed increasing interest for maritime security issues in general and maritime surveillance in particular. Building a coherent maritime security strategy to collect worldwide maritime intelligence and information will bring decisive benefits to the EU, both economically and politically. To do so, the EU must build a coherent cooperation framework – both between its own member States and with third parties. The main challenge to get there is less a technical one than a political one: member States will have to get used to sharing their own maritime security-related information with their EU partners.

Even though it would constitute only one layer in a broader surveillance architecture, space could represent a useful tool in this perspective. An open question concerns the coordination of the space segment of the future European maritime surveillance architecture. Given their respective expertise in maritime affairs and in the management of defense-related projects at the European level, both EMSA and EDA could be suitable candidates. Besides these institutional and organizational questions however, the use of space for maritime surveillance would represent an important political step forward. It would indeed be a clear expression of space as a foreign and security policy tool.


Remuss, Nina-Louisa. « Space and internal security – Developing a concept for the use of space assets to assure a secure Europe. » ESPI Report 20, September 2009, p. 27.

Germond, Basil. op. cit., pp. 1-2; 5.

The Wise Pen Team. op. cit., p. 21.

Adapted from Remuss, Nina-Louisa, 2009. op. cit., p. 21.


Ibid.

Ibid. p. 21.


It has to be noted though that international regulations only impose tracking devices to certain categories of vessels (basically above 300t). As a consequence, numerous vessels below that ceiling comply with the regulations even if they can only be tracked by “non-collaborative techniques”.


Assembly of Western European Union, op. cit., p.5.


The following two sections are based on: Remuss, Nina-Louisa, 2009.


The Wise Pen Team. op. cit., p. 12.

For an exhaustive overview of the organization of maritime activities in each EU member State, see: European Commission. « Integrated Maritime Policy for the EU. Working documents on offshore activities of coastal EU member States and cross-border cooperation. » November 2007.


Wilson, Andrew. « EUSC Support to Op ATALANTA. » Presentation at the AIES/ESPI workshop “Space and maritime security, strategies and capabilities to counter piracy.”, 30 November 2009.


The Wise Pen Team. op. cit. p.9.


Chief of European Navies (CHENs). op. cit.; The Wise Pen Team. op. cit.

Thomas, Guy. op. cit.

Earles, Marion. op. cit.


The Wise Pen Team. op. cit. p.9.