European Maritime Safety Agency

Copernicus Maritime Surveillance Service

User Requirements Workshop Report

V1.0

Date: 20/12/2016

European Commission

Copernicus Europe's eyes on Earth

EMSA

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1. Introduction

Copernicus is a European Union Programme aimed at developing European information services based on satellite Earth Observation (EO) and in-situ (non-space) data.[1] The European Maritime Safety Agency (EMSA) is the Entrusted Entity responsible for implementing the Copernicus Maritime Surveillance (CMS) service under a Delegation Agreement signed with the European Commission for the period 2015-2020.

The CMS service supports monitoring of human activity at sea for a range of functions, including amongst others, maritime safety and security, fisheries control, marine pollution monitoring, and law enforcement.[2] The CMS service can be accessed by national administrations with responsibilities at sea, as well as relevant EU bodies and institutions. It provides additional Earth Observation information through existing EMSA applications, and also establishes new opportunities to use remote sensing data in contexts in which it may not have been used in the past. Copernicus products can extend the geographical scope and enhance the types of maritime information available, thereby contributing to an overall improvement of maritime domain awareness.

In order to start the process of dialogue with users, and with the purpose of eliciting needs, generating new ideas, and gathering concrete requirements for existing and future services, a User Requirements Workshop was hosted at EMSA's premises in Lisbon, on 15 November 2016. The workshop took place between 09:00-17:00, and comprised a mixture of presentations, break-out sessions, and plenary feedback.

The workshop was aimed at both policy-makers and operational staff of administrations with responsibilities at sea, including those who are already users of EMSA services, as well as potential new users. In total, the workshop was attended by 120 participants. Representatives of 22 European Union (EU) Member State administrations were present: Belgium, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungry, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Spain, Sweden, and the United Kingdom. Two European Free Trade Association (EFTA) Member States, Iceland and Norway, also participated. The European Commission was represented by the following Directorate-Generals: Internal Market, Industry, Entrepreneurship and SMEs (DG GROW); Mobility and Transport (DG MOVE); Maritime Affairs and Fisheries (DG MARE). In addition, participants from the following bodies also attended the workshop: European Commission Joint Research Centre (JRC), European Border Agency (FRONTEX), European Defence Agency (EDA), European External Action Service (EEAS), European Fisheries Control Agency (EFCA), European Space Agency (ESA), European Union Satellite Centre (EU SatCen) and the Maritime Analysis and Operations Centre – Narcotics (MAOC(N)).

Image 1: European Commission (DG GROW) and EMSA

[1] For more information on the programme in general, please see www.copernicus.eu.
[2] The Copernicus Maritime Surveillance Service does not support border surveillance, for which a separate Copernicus service has been set up.

2. Welcome and opening

Leendert Bal, Head of Operations, EMSA, opened the workshop by welcoming participants. He provided an overview of milestones over the past year, including the signature of the Delegation Agreement in December 2015, the approval of the first Implementation Plan in May 2016, and the establishment of the Copernicus Maritime Surveillance (CMS) team at EMSA, which was completed in August 2016.

It was explained that the workshop would provide the necessary background information and overview of the service through presentations, following which it would be largely dedicated to break-out sessions. The break-out sessions were intended to take the form of an extended brainstorming exercise to exchange ideas, listen to users and discover user needs, and gauge the feasibility of offering services across a range of different activities.

A brief overview was given of how an earth observation (EO) component has now been added to existing EMSA services, and the benefits this can bring in monitoring activities at sea. It was emphasized that the CMS service will be focussed on the monitoring of human activity at sea, and in that context the timing of information is critical.

Finally, the ongoing cooperation between the European Space Agency (ESA) and EMSA was mentioned, and the ESA participation at the workshop was welcomed.

Image 2 : Workshop participants

3. Background to the Copernicus Maritime Surveillance (CMS) Service

Peter Breger, Deputy Head of Unit, and Rui Meneses, Policy Officer for Copernicus Security Services, of the European Commission's Directorate General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW) delivered a presentation providing an overview of the Copernicus Programme and the Copernicus Security Service.

Copernicus, formerly known as the Global Monitoring for Environment and Security (GMES), is an EU-led initiative for an autonomous and operational European earth monitoring capacities. It has been developed by the European Commission in partnership with the European Space Agency, with an envelope of €4.3 billion for the period 2014-2020.

The provision of Copernicus services is based on the processing of environmental data collected from EO satellites and in situ sensors. The EO satellites which provide the data exploited by the Copernicus services are split into two groups of missions: 1) the Sentinels, which are currently being developed for the specific needs of the Copernicus programme; 2) the Contributing Missions, which are operated by national, European or international organisations.

In addition to a space segment, the Programme aims to provide users with reliable and up-to-date information through a set of services. The services address six thematic areas: land, marine, atmosphere, climate change, emergency management and security. It was emphasized that although a principle of the general Copernicus Programme is that users are provided with free and open access to data and products, for the Security Service products are fully customised to user needs and have limited distribution.

To illustrate the range of products available, examples were drawn from the Copernicus Marine Environment Monitoring Service (CMEMS), the Emergency Management Service, and the Security Service (which, in addition to Maritime Surveillance, also comprises Border Surveillance and Support to External Actions). [3] The CMS service, implemented by EMSA, is one piece in a larger overall picture.

With regard to the CMS service, it was noted that a user-driven approach in preceding years had helped to define key areas for service delivery. A number of research and development demonstrations, consultation in ad-hoc forums, and particularly the findings of the Working Group on Maritime Surveillance, provided input to the definition of the Service Portfolio for the service. It was explained that a Service Portfolio for the CMS service was included as a Technical Annex to the Delegation Agreement signed between the European Commission and EMSA. Requests for additional services – those not defined in the original portfolio – can potentially be accommodated in future Implementation Plans, but will need the approval of the Copernicus User Forum and Copernicus Committee.

DG GROW emphasized the importance to the Commission of user uptake related to the services, and – in addition to liaising with EMSA for the establishment of operational services - encouraged users to contact their national representatives to the Copernicus User Forum and national delegates to the Copernicus Committee, as well as DG GROW on the dedicated email: ec.copernicus.mss@ec.europa.eu.

[3] In relation to a clarification question raised later by a workshop participant, it was noted that the CMS service is provided to authorised end-users via EMSA's Integrated Maritime Service (IMS), and certain CMEMS products and data are also available via the IMS and can therefore be displayed on the same interface.

4. The Copernicus Maritime Surveillance (CMS) Service

Pedro Lourenco, Head of Sector, Earth Observation Services, EMSA, provided an overview of the Copernicus Maritime Surveillance (CMS) service, activities to date, and plans for the future.

4.1 Service objectives

EMSA has been providing integrated maritime services (IMS) over a number of years in support of a range of functions in the maritime domain, including fisheries control, law enforcement and maritime safety and security. To date, these IMS services have not contained EO data on a systematic basis.[4] The CMS service will establish an EO component in these existing services, increasing the variety of information available, and expanding the volume of information and geographical scope of services. It will also provide the possibility to address new user needs which are currently not covered by existing services. The CMS service will provide support to national authorities with functions in the maritime domain and selected European bodies and institutions, and is tailored to specific end-user requirements.

The existing Copernicus services already being delivered for fisheries control and law enforcement, and the planned services for maritime safety and security, were summarised.

4.2 Fisheries Control

EMSA provides support to the European Fisheries Control Agency's (EFCA) coordinated Joint Deployment Plan operations (JDP) for monitoring fisheries activities in selected areas of interest. EMSA provides EFCA with a real time maritime awareness operational picture, fusing and correlating different sources of vessel data with specific information from EFCA operations, and now with Copernicus earth observation data. The service provided through EFCA is delivered to more than 500 users across 21 EU Member States.

Earth observation capabilities support a range of operational fisheries control activities, including monitoring of:

- fishing grounds, in order to:
  - provide a situational awareness picture,
  - monitor fishing effort,
  - monitor discard bans,
  - cross-check monitored fishing activity with recording obligations,
  - check vessel behaviour in restricted areas.
- fish cages and fish farms, in order to:
  - monitor operations and vessels close to fish farms,
  - reveal unreported fish farming in 3rd countries,
  - detect tug vessels towing cages.
- fishing ports, in order to:
  - monitor recording and reporting requirements of the EU fleet,
  - monitor ports,
  - detect non-reporting vessels (when combined with intelligence information).

The CMS service supports fisheries control operations in the following areas: Atlantic (Northwest Atlantic Fisheries Organization and North East Atlantic Fisheries Commission areas); Mediterranean

[4] The EMSA CleanSeaNet satellite-based oil spill and vessel detection service, operational since 2007, is the only EMSA service which has delivered earth observation data in large quantities over a regular period. For more on this service, please see: http://emsa.europa.eu/operations/earthobservationservices.html

and Canary Islands; North Sea and Western Waters (North-east Atlantic); Baltic Sea; and the Pacific Ocean

Between 1 September and 15 November 2016, over 160 satellite images were acquired by the CMS service and delivered to EFCA to support fisheries control operations.

In the area of fisheries control, ad-hoc support was also provided to the United Nations Office on Drugs and Crime (UNODC) to support an exercise on tracking illegal fishing vessels in São Tomé and Príncipe (September 2016).

4.3 Law Enforcement

Integrated maritime services provided by EMSA can be used for a range of law enforcement purposes. Vessel information originates from both terrestrial and satellite-based telecommunication systems as well as other available positioning data, is correlated against vessel detections extracted from EO data (synthetic aperture radar and optical images). One law enforcement area with particular need for additional satellite images in the maritime picture is anti-narcotics/anti-drug-smuggling. Through the CMS service, EMSA is able to provide satellite earth observation data to the Maritime Analysis and Operations Centre – Narcotics, MAOC(N). MAOC(N) is an initiative of seven EU Member States: France, Ireland, Italy, Spain, the Netherlands, Portugal and the United Kingdom (UK).

The main area of operations for MAOC(N) is the Atlantic Ocean. The CMS service will provide support to: monitoring of identified ports and shores for departure of specific ships; detection of abnormal behaviour (e.g. transhipment of drugs from larger vessels to small boats); and searching for non-cooperative targets. MAOC(N) has used the service for short-term acquisitions, requesting very high resolution optical images only two days in advance of operations.

4.4 Maritime Safety and Security

Under the CMS service, it is expected that support will be given to maritime safety and security operations. This part of the service will be gradually rolled out with volunteer Member States after a requirement gathering phase and operational feasibility activities.[5] Some examples of potential applications foreseen under the service are listed below:

- Support to traffic monitoring
- Support to search and rescue operations and identification of ships in distress
- Rapid surveillance following loss of contact with vessel or platform
- Support to ice and iceberg monitoring
- Detection of floating containers and missing aircrafts at sea
- Monitoring of ship-to-ship transfers (e.g. at-sea refuelling).

Other potential products not foreseen under the initial service definition may be of interest to Member States. There has been recent interest for example in the tracking of lost containers and detection of debris from missing aircraft. These products and others which have not already been included in the service portfolio, may be accommodated in future Implementation Plans, dependent on an analysis of technical and operational feasibility and subsequent approval in the relevant forums (Copernicus User Forum, Copernicus Committee, and via DG GROW).

4.5 How to access the Copernicus Maritime Surveillance (CMS) service

4.5.1 Service scope

The Copernicus Maritime Surveillance (CMS) service provides earth observation information (satellite images and value adding products) to support a better understanding and improved monitoring of activities at sea. The CMS service is available through EMSA's integrated maritime services (IMS) to

[5] Interested Member State administrations should see section 4.5.: 'How to access the Copernicus Maritime Surveillance service'.

support a wide range of operational functions.[6] The CMS service provides support to interested Member State administrations and European bodies exercising functions in the maritime domain. The functions currently foreseen under the CMS service include:

- fisheries control,
- maritime safety and security,
- law enforcement,
- customs,
- marine environment monitoring, and
- other (e.g. defence).

Please note that the CMS service *does not* support border surveillance functions, for which a separate Copernicus Border Surveillance service has been implemented.[7]

4.5.2 User-specific services

The CMS service forms one component of the broader Integrated Maritime Services (IMS) offered by EMSA. Access to the IMS service can be provided either through a web user interface that displays the data via a secure portal or through a system-to-system interface. Access is provided only to authorised users.

Each user group will have requirements for specific EO products that are unique according to functions undertaken and areas of operation, and between each user group there will be differences, for example: geographic area of interest; types of satellite images required (synthetic aperture radar or optical); time of day or period of the year of operations; and value-adding of products such as vessel detection or activity detection. There is therefore no one generic service delivering the same EO information to all users.

It is also worth noting that within IMS the existing access rights will continue to apply with regard to other data sources such as vessel position information.

4.5.3 Access to the CMS service

Requesting access to the CMS will depend on the functions being exercised:

1. Fisheries control:
    - If you are interested in CMS for the purposes of fisheries control, please contact the European Fisheries Control Agency (EFCA), which coordinates user access for this particular service component, at: Marsurv-3@efca.europa.eu.

2. Law enforcement:
    - A law enforcement service is currently being delivered to the Maritime Analysis and Operations Centre – Narcotics (MAOC (N)), an initiative by seven EU Member States providing a forum for multi-lateral cooperation to suppress illicit drug trafficking by sea and air.
    - For other users with law enforcement requirements please see below under point 3.

3. Maritime safety and security, law enforcement, and customs:
    - Please contact the EMSA Copernicus team directly at copernicus@emsa.europa.eu to discuss your specific needs in terms of earth observation information and products.

4. Other functions requiring maritime surveillance:

[6] These functions are defined in a service portfolio included as an annex to the Delegation Agreement signed between EMSA and the European Commission.
[7] With the Delegation Agreement finalised on 10 November 2015, the European Commission entrusted Frontex with the border surveillance component of the Copernicus Security Service. For further information on the border surveillance service, contact: efs@frontex.europa.eu

- If you are interested in using the CMS service for other functions, for example defence, or other areas not listed above, you should contact the EMSA Copernicus team directly at copernicus@emsa.europa.eu.
- Coordination with the European Commission (DG-GROW) may be necessary in order to include these functions in future implementation plans. Users are encouraged to contact EMSA to discuss how to proceed.
- As noted above, border surveillance requirements are addressed by the Copernicus Border Surveillance service, and not by the Copernicus Maritime Surveillance service.

Please contact the EMSA Copernicus team at copernicus@emsa.europa.eu, cc the Commission at ec.copernicus.mss@ec.europa.eu, at any time with questions, comments, suggestions, or additional requirements.

5. EMSA's Integrated Maritime Services (IMS)

Samuel Djavidnia, Senior Project Officer, Integrated Maritime Services, EMSA, gave an overview of the key features of the IMS. He explained that EMSA has developed a platform to guarantee the performance, availability and reliability of all the maritime information systems it hosts. This platform integrates and correlates different types of data, including data provided by the end-users, to produce customised services tailored to specific requirements. These services are called Integrated Maritime Services (IMS), and are used by Member State authorities and EU bodies to obtain the most complete maritime situational awareness, building a common picture across EU maritime interests.

IMS are configurable, voluntary, functionalities, promoting regional, national and local cooperation, providing an enhanced maritime picture, using the integration capability, following the agreed access rights and responding to the data users' specific needs. These functionalities foster the sharing and exchange of data between different users and applications and provide additional, complementary and supportive tools. They do not replace any existing systems and mandatory system functionalities and are offered to Member States following a functional approach. EMSA delivers integrated maritime services by combining data to provide a more complete overview of activities at sea. The basic raw data provided by existing systems (including for example vessel position and tracking data such as automatic identification system [AIS] and long range identification and tracking [LRIT] data) is enriched with additional information from other/users' own sources, and complemented by quality cross-checking and validation, all in automated manner. In addition, EMSA can add satellite-based products, including EO data acquired through Copernicus, to enrich the maritime picture. IMS are used by EU Member States, EFTA Member States and acceding and candidate countries. There are currently approximately 1,200 individual users, including: operational units/services for maritime safety and security, pollution preparedness and response, search and rescue, border control, customs authorities, and coast guards.

IMS are managed at national level by the IMS Point of Contact (PoC), i.e. the body appointed by the Member State, which is a single point of contact for the Integrated Maritime Services related matters and assumes, at national level, responsibility for: coordination of data users and, if applicable, data providers; the designation of the national IMS administrator; the access rights coordination with the competent authorities, and user requirements coordination.

A short video was shown and a live demonstration given of different forms in which the service can be delivered through the web interface on a desktop computer or the mobile application. It was noted that services can also be offered through system-to-system interfaces to Member State authorities.

For more information, contact: ims@emsa.europa.eu.

6. Break-out sessions

Breakout sessions during the morning and afternoon provided an opportunity for attendees to participate more actively and share ideas on topics of particular interest and relevance to their tasks. Some administrations with several participants were able to be present in all the break-out sessions. Others chose according to interest. A limited number of participants chose to be in different sessions in the morning and afternoon. The size of the break-out session groups varied from below 20 to almost 40 participants; however, each of the sessions was conducive to more in-depth discussion than was possible during the plenary.

6.1 Break-out session: maritime safety and security

The maritime safety and security break-out session was attended by approximately 40 participants; some of these were already familiar with EMSA's services, while others were potential users with ideas for new services based on EO products.

6.1.1 Support to traffic monitoring

Support to traffic monitoring is of considerable importance to many users, particularly in remote areas with high density maritime traffic. The following applications were highlighted as being of interest:

- Detection of vessels and monitoring adherence to Traffic Separation Schemes, Ships Routing Systems, Ship Reporting Systems or any other similar measures enforced to improve safety of navigation.
- Detection of vessels in restricted areas, prohibited areas, or any other areas of interest within the scope of the maritime safety.
- Detection of vessels anchoring in territorial seas.
- Detection of vessels and vessel characteristics (e.g. size, types) in polar areas.
- Monitoring of vessels in need of assistance.
- Contributing to the overall maritime picture of traffic density and supporting the planning of any new traffic measures, particularly in remote areas.

Support to traffic monitoring could be based on vessel detection and delivered through IMS in combination with data from other sensors with support of automatic behaviour monitoring algorithms. The attributes for such a service could be composed of EO products with the following characteristics: spatial resolution higher than 20-50 metres; routine tasking type; delivery time around one hour; revisit time preferably more than twice a day (ideally four to six times a day).

6.1.2 Support to search and rescue operations and identification of ships in distress

It was recognised that satellite-based surveillance can be exploited in the context of search and rescue operations and identification of ships in distress, with economical and operational gains in: i) extending the area of interest; ii) maintaining the surveillance or search operation for a longer duration, and; iii) using multi-mission tasking while the operation is running.

The synthetic aperture radar image works like one sweep of a ship's anti-collision and navigation radars, but with a wider extent. Hence, the synthetic aperture radar provides more sweeps over the area of interest per day of operation. For example, if the service provides images over the area of interest twice a day, the entity conducting the search and rescue operation will be supplied with additional sweeps over wider areas.

Within this topic, the following sub-areas were identified as being of interest:

- EO data can be used to extend the search area and can be integrated and correlated with other sources of information (e.g. intelligence, transponder data). Very high resolution

synthetic aperture radar and optical images can be used to update the maritime picture while operations are running. In the remoter areas of national search and rescue regions, the need for this service is even clearer due to the challenges of deploying conventional assets.

- Detection of vessels not transmitting AIS (e.g. sailing vessels, small cargo vessels) are of major concern in search and rescue operations.
- Satellite or remotely piloted aircraft system (RPAS) with video streaming is also of interest for search and rescue operations.
- EO data can contribute to distinguish false alarms regarding emergencies at sea.
- Participants expressed interest in accessing EO data immediately after an emergency at sea. This would require improved in-orbit tasking, allowing the acquisition order to be programmed as quickly as possible after the emergency event.
- The need for availability of a centralised list of planned EO data for consultation purposes was expressed. Exceptionally, data might be requested to build a more complete maritime picture following an emergency situation.
- Under the scope of safety of navigation, it was mentioned that using synthetic aperture radar images to capture the surface signature of schools of whales in known migration routes could be of benefit for small vessels in transit.
- The possibility for EMSA to deliver EO data during Member State search and rescue exercise operations should be further explored.

6.1.3 Rapid surveillance following loss of contact with vessel or platform

Detection and tracking of missing vessels and platforms when transponder data and/or communications are lost is useful in a number of situations: to support search and rescue operations, monitor offshore platforms surroundings, detect naval targets of interest and assess piracy hijacking scenarios. The following user requirements were considered:

- Increasing the revisit time of satellite data acquisitions (radar and optical) over an area of interest would add value;
- Monitoring uncorrelated targets that switch off the AIS when approaching offshore platforms (at least in the Baltic and Adriatic seas), can provide added value to the safety and security of oil and gas installation platforms.

6.1.4 Support to ice and iceberg monitoring.

Synthetic aperture radar images support the building of routine ice charts and some countries in the north of Europe have been using EO data for ice monitoring and daily ice charting. Iceberg risk reduction might be achieved by augmenting revisit time of synthetic aperture radar images, i.e. to have more and higher resolution synthetic aperture radar images available for iceberg detection. The products needed for ice applications, both for Arctic and Baltic Seas, consist of Radarsat-2 data. For these two areas, more detailed requirements were noted:

- Baltic Sea:
    - Product: Radarsat-2 images with different polarizations
    - Resolution: 100 to 200m
    - Tasking type: Routine
    - Delivery: 3 hours
    - Period: November-May
    - Revisit: Daily or twice per day
- Arctic: synthetic aperture radar images; daily coverage; resolutions of 10 to 20m to detect small icebergs which constitute navigation hazards of concern, especially over choke zones.

The required spatial resolution spans from medium resolution for overall assessment of a broader area, to high resolution for mostly ice covered waters and very high resolution in sensitive ice infested waters.

6.1.5 Detection of floating containers and missing aircrafts at sea

There are no clear figures regarding the number of containers lost at sea, but a report by the World Shipping Council suggests that in the period 2011-2014, approximately 733 containers were lost at sea annually, not including catastrophic losses. Catastrophic losses (such as 4,293 containers lost during the sinking of the *MOL Comfort* in 2013) increase that average considerably.[8] These types of incidents at sea can endanger people and the environment. In addition, aircraft incidents at sea, such as the loss of the Egypt Air flight over the Mediterranean in 2016, the Malaysian airlines flight in 2014 and the Air France flight over the Atlantic in 2009, have drawn attention to this issue as an area of concern of Member States.

These applications should be considered under the CMS service in future. The following suggestions were made:

- Experience with validated algorithms used for iceberg detection can be adapted to detect small objects at sea which are approximately the same size as containers or debris from aircraft (less than 15 metres);
- Monitoring shipping routes regularly for detecting lost containers, especially in identified hotspots and following significant meteorological and oceanographic events, should be considered.

6.1.6 Monitoring of ship-to-ship transfers (e.g. at-sea refuelling)

The monitoring of at-sea refuelling constitutes a concern of certain Member State authorities that have the responsibility to authorise and monitor these activities in their national jurisdictions. The participants expressed the need for an application that detects these activities through automated behaviour monitoring.

[8] *Survey Results for Containers Lost At Sea – 2014 Update*, World Shipping Council (2014), downloaded November 2016: http://www.worldshipping.org/industry-issues/safety/Containers_Lost_at_Sea_-_2014_Update_Final_for_Dist.pdf

6.2 Break-out session: measures against intentional unlawful acts

The break-out session was attended by a number of existing users who already access CMS services on an operational basis for law enforcement purposes (i.e. EFCA for fisheries control; MAOC(N) for anti-narcotics operations), and a number of potential new users who were not familiar with the service and had a variety of different needs. This generated interesting discussions around what is possible with current technology, and the range of operational activities which are already, or can in future be, supported through the CMS service. EMSA and the workshop participants themselves highlighted that user feedback is key, not only for the successful ramp up of operations for CMS but also to improve the quality of the services to be provided to users. As noted by one participant, the demonstration of the CMS added-value services is only possible if users place EO service requests, as MAOC(N) is already doing.

6.2.1 International and/or inter-sectoral cooperation

It may be possible to identify commonalities between some of the CMS service users, i.e. between Member States or between European bodies. This is potentially useful, particularly in relation to acquiring EO data over areas of common interest. The possibility of sharing a list of acquisitions to be acquired was discussed. Some images ordered by one user may be of use to other parties too. The availability of a centralised list of planned EO data, possibly through a common platform, could be beneficial. It was recognised that there are also cases in which law enforcement users may not want any other parties to be aware of the locations/activities of interest, and therefore any developments in this area should be analysed carefully.

6.2.2 Functionalities of interest and technical limitations

In general there is a need for real-time availability of products, particularly in cases of dynamic events such as search and rescue and law enforcement. As identified by several attendees, in certain types of operations such as anti-piracy and smuggling, tasking requests are often received at short notice and requires the tasking of EO satellites within a few hours as well as delivery of data in near real time (less than 30 minutes). Given this, the current time from tasking EO data to delivery is too long to be useful in the existing operational context.

The capability for tracking of non-reporting vessels could be interesting, but only if it is possible to have regular EO acquisitions (i.e. hourly). The current state of the art of EO technology is still far from being able to provide very high resolution acquisitions with a frequency close to one hour.

As highlighted by customs and anti-piracy related users, routine acquisitions are useful to improve knowledge of the assets available in an area as well as to identify vessels of interest that may need to be pinpointed, for which a short-notice request could then be submitted in order to get more details.

It was also noted that improving the analysis of EO data for the detection of skiffs would be useful in the area of law enforcement. Work has been done to identify skiffs based on the detection of wakes, but it is difficult to detect skiffs in the absence of a wake.

6.2.3 Operational use cases of interest

The different backgrounds of the participants, and the varying level of experience they had in using EO data, made the discussion on applications interesting. Some concrete examples were given of how the CMS service has been used for fisheries control and anti-narcotics operations. Other ideas were completely new, and have not yet been captured in the service portfolio (e.g. monitoring WWII wreck areas to prevent pillaging; transhipment of illegal logging products). One key conclusion emerging from the discussion was that the Copernicus service could be useful for a whole range of illicit activities which involve loading in ports or transhipment events. This includes areas more typically associated with unlawful activity, such as drug trafficking and human trafficking, but also particular cases such as illegal logging. Some participants were interested in the potential use of EO services for monitoring compliance in relation to illegal ship-source discharges on the high seas, not

just for oil discharges (which is done through the CleanSeaNet service) but for other sources of MARPOL violations. Users also identified a potential use for low-medium spatial resolution EO data to monitor vessel-based sulphur emissions in the high seas. Finally, there was a discussion on the possibility of using EO data to identify illegal usage of fish aggregating devices (FAD); this topic will need to be further analysed by EMSA and EFCA.

6.2.4 Earth observation data as intelligence and as evidence to be used in court

EO data in support of law enforcement activities are often acquired for operational purposes, for example to detect or identify vessels or suspicious activity in an area of interest. This provides information which contributes to the overall intelligence picture being built up by the law enforcement entity and enables them to carry out operations and activities.. However, it was noted that the law enforcement chain extends from surveillance and detection of a possible unlawful activity, to further investigation, and in some cases subsequently to compilation of evidence in advance of prosecution. In relation to the use of EO as evidence for judicial procedures, it was clear there are different practices in place depending on the sector, country and particularities of the case. It was noted that images would generally not be used as evidence, but some examples were given of situations in which images could potentially be used and/or EMSA participation (in the form of providing an EO expert) could be requested to support court cases.

6.3 Break-out session: new satellite technologies and applications

The aim of this session was to gather user requirements linked with potential new satellite missions, technologies and applications that can address existing limitations or gaps in service provision for maritime surveillance applications. The session garnered significant interest from a wide range of users from different Member States exercising different functions. It was clear that each different function has specific needs that should be catered for. From this session there were three main conclusions that will be elaborated further:

- Satellite mission requirements are highly dependent on the use case: depending on the need, the requirements will vary (i.e. to support search and rescue operations the requirements in terms of EO data are different than those linked with fisheries control or law enforcement).
- It is important to leverage the value of EO information by combining it with non-EO data from complementary systems (existing or future). These complementary systems can provide vessel reporting information (AIS, LRIT, etc.) or other maritime surveillance data streams (RPAS, coastal radar, etc.).
- Although for very high resolution optical there is a wide range of commercially available satellite missions, there are more severe limitations in terms of availability of quasi real time (QRT) synthetic aperture radar missions at European level. Requirements for a new synthetic aperture radar satellite mission were compiled, considering a wide range of user needs.

6.3.1 Maritime surveillance satellite missions needs

During the discussions several needs for different functions were identified. The table below summarizes the main ones:

Function	Need
Search and rescue	▪ Optimal scenario includes tasking and reception of EO products in 30 minutes, after emergency call is triggered. ▪ Potentially the reception of information up to one hour after triggering would still be useful. ▪ For remote areas these times could be higher as the assets will take more time to reach the specific areas.
Law enforcement	▪ Ability to detect vessels 5 metres in length (or longer). ▪ Ability to detect/identify non-reporting vessels of interest. ▪ Rapid surveillance of an area (ability to task the satellites 3-6 hours before satellite overpass). ▪ Quasi real time delivery of information. ▪ Ability to identify the type of vessel. ▪ Ability to detect specific types of vessels (i.e. skiff detection as CMS product). ▪ High revisit times to enable tracking of specific vessels.
Defence	▪ Patterns of life and activity based intelligence are an important product for this service. ▪ RPAS data is an importance source of complimentary information. ▪ Satellite AIS data is an important source of complimentary information.
Horizontal/common	▪ Future synthetic aperture radar missions should have satellite AIS receivers. ▪ Joint use of images between different functions needs to be coordinated. ▪ Service levels should consider not only European waters but also Exclusive Economic Zones (EEZ) outside of Europe (e.g. Overseas Territories) ▪ Although there is a wide range of needs, there is convergence in a set of technical requirements for new missions.

Although the needs are diverse, considering the different functions represented, there was some convergence in terms of requirements for satellite missions that support maritime surveillance. The following figures try to illustrate the generic requirement of a certain function, against the different aspects that define a satellite mission:

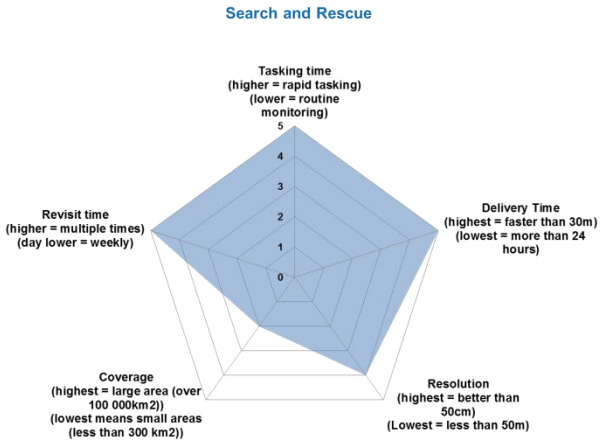


Figure 1 – Example of the satellite mission requirements to fullfill a search and rescue scenario

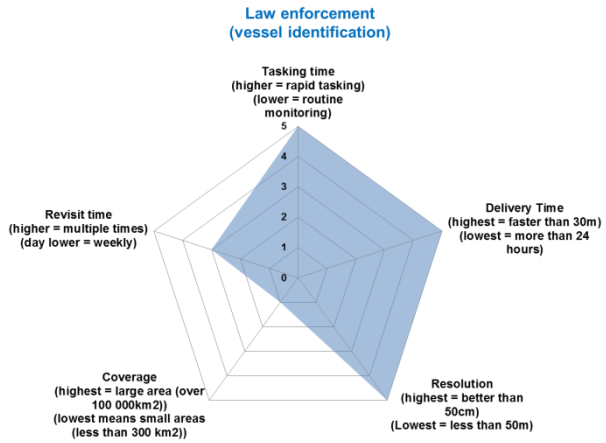
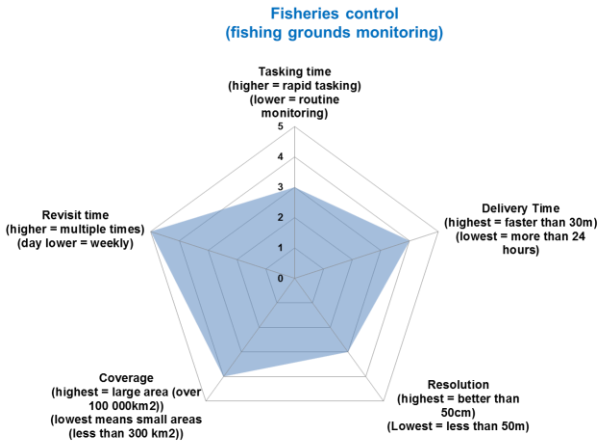


Figure 2 – Example of the satellite mission requirements to fullfill a a Law enforcement (vessel identification scenario)



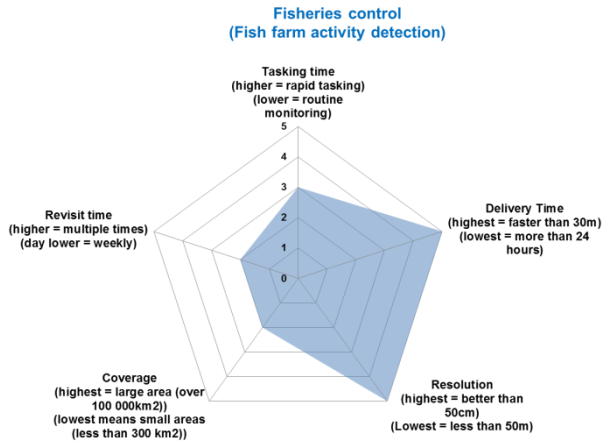


Figure 3 – Example of the satellite mission requirements to fullfill two fisheries control related scenarios

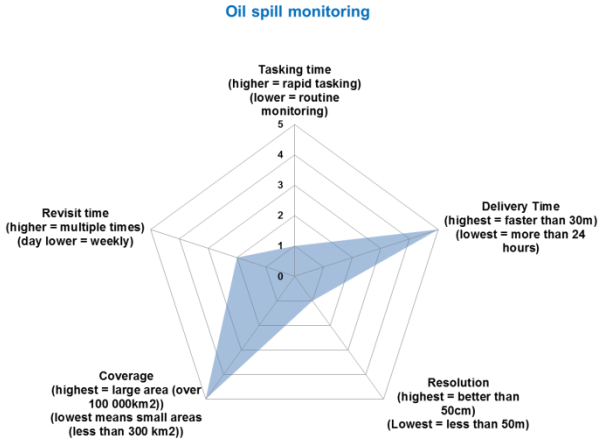


Figure 4 – Example of the satellite mission requirements to fullfill a oil spill monitoring scenario

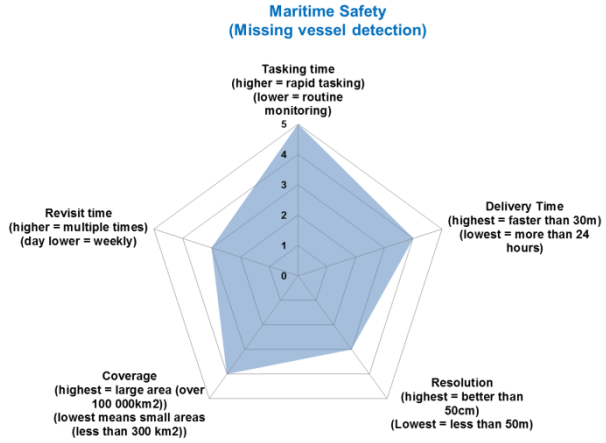


Figure 5 – Example of the satellite mission requirements to fullfill a Maritime Safety (support to the detection of a missing vessel).

6.3.2 Synergies with existing and future complementary systems

It was clear from the discussions during the break-out session that EO data in support of maritime surveillance cannot be considered in isolation. The need to explore synergies with existing and future complementary systems was considered paramount by users. These systems include:

- AIS networks (either data acquired by satellite or from terrestrial ground stations);
- RPAS data streams;
- High frequency radar;
- Geostationary high resolution optical (GEO-HR)[9]

Additionally participants also mentioned the need to explore synergies with other EO satellites that are less immediately relevant for maritime surveillance, but may provide important support/ancillary information relevant to the service. Missions like Sentinel-1 or Sentinel-2 can feed in useful information in big data scenarios used to tackle requirements linked with patterns of life or activity based intelligence.

6.3.3 New synthetic aperture radar mission potential requirements

There was thorough discussion on the existing limitations of QRT synthetic aperture satellite missions linked with the support to maritime surveillance activities. The clear need for additional European satellite mission capacity was highlighted. The requirements for new synthetic aperture radar missions identified by the group are presented in the table below.

Requirement type	Description
Operational	▪ All-weather 24/7 monitoring
Revisit time	▪ 4 to 6+ acquisitions over the same area per day (requires satellite constellation). ▪ Ability to monitor the same area at different times of day (i.e. every 4 hours)
Delivery time	▪ QRT (15 minutes) over European EEZs, both in Europe and outside (e.g. Overseas Territories)
Tasking time	▪ In-orbit tasking (less than 1 hour before acquisition)
Resolution	▪ 1 metre to 15 metre (very high and high resolution)
Coverage	▪ Wide coverage for both very high and high resolution (swath width bigger than 50km) ▪ Long swaths for extended area monitoring (high satellite duty cycle enabling coverage of wide areas)
Other Sensors	▪ On board AIS receiver

[9] ESA pointed out that they have been exploring for some years the possibilities of optical persistent imaging from geostationary orbit (project GEO-HR), based on user requirements from several organizations to address maritime safety and security, and disaster management use cases. This system can be considered an additional observation capability in a long-term scenario and gap-filling in areas such as law enforcement and piracy, since it provides relatively high spatial resolution (4 metres), multispectral capabilities, short service provision cycle (15 minutes) and video mode acquisitions.

6.4 Break-out session: open session for new ideas and policy directions

The purpose of the 'Open session for new ideas and policy directions' was to step back from the direct user requirements being elaborated for specific applications and technical aspects in the other sessions, and to take a broader perspective. User requirements evolve in a broader policy setting, and the session tried to understand and capture some of the key tendencies driving the future expansion of maritime surveillance services, and the barriers that might be encountered.

The session attracted a range of participants of different backgrounds, from both policy and operational fields. As well as national administrations, national Copernicus representatives and representatives of EU bodies and Agencies were present.

Discussions were wide-ranging and diverse. Some of the key points addressed at more length have been captured below.

6.4.1 Satellite requirements

The session opened with a short discussion on satellite missions. It was noted that the current family of Sentinel satellites are not necessarily suitable for the needs of maritime surveillance. They fit the needs of the overall Copernicus programme well, and were designed with that in mind; but the Security Service has particular specificities and is often used for targeted operations. For the maritime surveillance service, Sentinel information needs to be supplemented by that of the contributing missions. In terms of satellite capabilities, there is a need for more flexibility of modes, faster tasking times, and higher resolution. However, one issue which is key when acquiring images from commercial services is ensuring that the acquisition will have the highest priority. For national administrations to plan operations around satellite acquisitions, they need to feel secure in the knowledge that the service is reliable.

6.4.2 Image data for strategic intelligence

It was noted that most assumptions revolve around the use of satellite data in immediate operational scenarios. There may also be a benefit in analysing cumulative historical satellite data for pattern analysis, with a view to developing better strategic intelligence.

6.4.3 Necessity of complementary data

The role of in-situ data to complement satellite data was emphasized. There was a lengthy discussion on the benefits and limitations of satellite data and how certain data sources, in particular remotely piloted aircraft system (RPAS) data is necessary to ensure on site surveillance. It was suggested that satellites could provide initial overview information of targets that were worth further investigation, with RPAS able to quickly deploy to the scene for more in-depth surveillance. It was noted that in military scenarios the benefits of deploying RPAS are often linked to the safety of personnel on-scene, and that this is not the case in the civil domain, where the case for RPAS has to be made in economic terms in comparison with manned aircraft. In a maritime context there was a discussion over where additional in-situ data to support satellite acquisitions was most valuable: in coastal areas where there are many assets and other data sources such as coastal radar, satellite data is already well complemented. This is not the case at the more distant reaches of a national EEZ, where there may be little in the way of supporting surveillance means, and where additional means such as RPAS could enhance the value to be derived from satellite data.

6.4.4 Support to navies and the defence community

There is clear interest from the naval and defence communities in receiving the CMS service. Reference was made to the traditional division between the civil and defence sectors, and in particular the differing approach with regard to access to and subsequent classification of data and security-related issues in data transfer and sharing. It was noted that with respect to Copernicus maritime surveillance data, there may be solutions which are simple to implement, such as providing data input

in an unclassified form, which is subsequently defined as classified by navies and defence bodies at the stage at which they add intelligence information. In terms of Copernicus services, it was noted that close collaboration should be fostered between EMSA and the EU Satellite Centre (EU SatCen), which deals directly with this user community.

6.4.5 Global areas of European interest

The extension of services to areas of European interest beyond EU waters was discussed. Activities in the Gulf of Guinea were subject to particular discussion, as various participants in the session (e.g. navies, European External Action Service, EU SatCen) had interests in the region. The need for both top-down and bottom-up initiatives to ensure coordinated effort in the region was emphasized. With regard to Copernicus, it was agreed that an effective approach could be to establish services to a particular entity (e.g. a national navy with assets in the region) to gain concrete experience of how the CMS service might be used in practice in the area.

7. Conclusions

Leendert Bal, Head of Operations, EMSA, offered thanks to all the participants for their contributions during the workshop. Special thanks were offered to the moderators and rapporteurs, who contributed substantially to ensuring that the break-out session ran smoothly and captured all the concerns and key observations of participants.

An overview was given of some of the main points which had emerged across the course of the day – either those which had been noted as particularly important by participants, or which had been raised in more than one context or in different break-out sessions, indicating an area of transversal interest. These were as follows:

- Satellite technologies
  - There are limitations in current SAR satellite mission capabilities for maritime security and surveillance. The following requirements were highlighted by the users, critical to a wide range of activities:
    - Rapid tasking time and quasi near real time delivery time;
    - High revisit rates (4-6 times a day with global scope in areas of European interest);
    - Resolution (1 to 15 meters).
    - Wide area coverage
    - On-board AIS receiving capabilities
  - The reliability of services (availability and priority) was noted as particularly important.

- Complementary data
  - Access to vessel positioning information (i.e. Satellite AIS) in combination with EO data was deemed crucial by the users represented.
  - Interest in the role of remotely piloted aircraft system (RPAS) data as an 'in situ' complement to satellite data is high, and was mentioned in several different contexts.
  - Video-streaming could potentially add value, whether from satellite or RPAS.

- Data integration
  - Users expressed the need for tracking non-correlated targets.
  - EO data shall also be used as complementary to existing data sources (e.g. AIS or LRIT) and integrated in Automatic Behaviour Monitoring algorithms.

- Service delivery
  - It was noted that there is no generic CMS service, but that it is always tailored to each user or user group.
  - Sharing of images acquired for one user group with another group could provide benefits, depending on the type of image and on common agreement to do so. The sharing of (non-sensitive) acquisition planning lists was also discussed.

- Maritime Safety applications
  - The following activities were defined as priority by users:
    - Support to vessel detection/traffic monitoring, particularly in remote areas;
    - Support to search and rescue operations and identification of ships in distress. Vessels not transmitting AIS (e.g. sailing vessels, small cargo vessels) are a major concern;
    - Support to ice and iceberg monitoring;

- Navies and defence community
  - There is strong interest from navies and defence community in receiving the CMS service.

- Services outside European waters
    - There is a clear need for global services from users undertaking the following functional activities: fisheries control; anti-drugs smuggling; defence; measures against piracy and armed robbery.
    - Gulf of Guinea was identified by multiple users as a priority area.
- Potential new CMS EO products
    - Detection and tracking of floating containers.
    - Detection of aircraft debris

With regard to the capacity of current satellite technologies, which is beyond the scope of EMSA's mandate, the user requirements identified during the workshop will provide valuable input for the ongoing work being done by the Commission. Emphasis was given by the users on the need for new satellite SAR missions for maritime security and surveillance purposes.

In terms of short term service requirements, EMSA will explore further which elements can be implemented in the near future (2017), and which need additional feasibility and assessment before entering into operations (potentially from 2018).

New user requirements which are not covered by the Service Portfolio will be analysed and presented to the Copernicus Committee and User Forum for decision and inclusion in future activities.

Peter Breger, Deputy Head of Unit, DG GROW, reinforced how important the workshop discussions were in providing a base of information from which to move forward. It was noted that even the shortcomings of data availability and services provide insights which will result in improvements in future developments. From a Commission perspective, the importance of disseminating information on the Copernicus Programme more generally was noted. Rui Meneses, Policy Officer for Copernicus Security Services, DG GROW, emphasized that participation in the workshop is the beginning of a longer process, and that interested participants should not hesitate to contact the Commission for any reason.

Appendix A List of Annexes

Annex 1	Acronyms and abbreviations
Annex 2	Copernicus Maritime Surveillance Service User Workshop Agenda
Annex 3	Participant list

Annex 1: Acronyms and abbreviations

ABM	Automated Behaviour Monitoring
AIS	Automatic Identification System
AOI	Area of Interest
DG GROW	European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SME (Small and Medium Enterprises)
DG MARE	European Commission's Directorate-General for Maritime Affairs and Fisheries
DG MOVE	European Commission's Directorate-General for Mobility and Transport
EC	European Commission
EDA	European Defence Agency
EEAS	European External Action Service
EEZ	Exclusive Economic Zone
EFCA	European Fisheries Control Agency
EFTA	European Free Trade Association
EO	Earth Observation
EODC	Earth Observation Data Centre
ESA	European Space Agency
EU	European Union
EU SatCen	European Union Satellite Centre
FAD	Fish aggregating devices
GMES	Global Monitoring for Environment and Security
GUI	Graphical User Interface
IMS	Integrated Maritime Services
JDP	Joint Deployment Plan
JRC	European Commission - Joint Research Centre
LRIT	Long Range Identification and Tracking
MAOC (N)	Maritime Analysis and Operations Centre – Narcotics
MARPOL	International Convention for the Prevention of Pollution from Ships
NRT	Near Real Time
OCT	Overseas Countries and Territories
QRT	Quasi Real Time
RPAS	Remote Piloted Airborne Systems
S-AIS	Satellite Automatic Identification System
SAR	Search and Rescue
SAR	Synthetic Aperture Radar (satellite sensor)
SEG	SafeSeaNet Ecosystem GUI
SOLAS	International Convention for the Safety of Life at Sea
SSN	SafeSeaNet
UNODC	United Nations Office on Drugs and Crime
VMS	Vessel Monitoring System

Annex 2: Agenda

Chair: Leendert Bal, Head of Department: Operations

Tuesday, 15 November 2016 EMSA Conference Centre

Time	Agenda Item
09:15 – 09:30	**Welcome and opening**
09:30 – 10:00	**Background of Copernicus Maritime Surveillance Service** - Copernicus Programme - Copernicus Security Services
10:00 - 10:30	**Copernicus Maritime Surveillance Service** - Service strategy and use cases
10:30 – 11:00	**EMSA's Integrated Maritime Services**
11:00 – 11:30	Coffee
11:30 – 11:45	**Introduction to break-out sessions**
11:45 – 12:45	**Break-out sessions (morning)** - **Maritime safety and security (Conference Centre):** o Support to search and rescue operations o Ice-monitoring o Identification of ships in distress o Rapid surveillance following loss of contact with vessel or platform o Detection of floating containers o Monitoring of ship-to-ship transfers (e.g. at-sea refueling) - **Measures against intentional unlawful acts (Room -1.06):** o Illegal, unreported and unregulated fishing o Trafficking and smuggling of contraband (e.g. narcotics, arms, other goods) o Piracy and armed robbery o Illegal ship-source discharges and other MARPOL violations o Monitoring of compliance with customs regulations - **New satellite technologies and applications (Room -1.13):** o User requirements related to timeliness and tasking times o New requirements for satellite missions, products and services - **Open session for new ideas and policy directions (Room -1.12)**
12:45 – 14:00	Lunch
14:00 – 15:30	**Break-out sessions continued (afternoon)**
15:30 – 16:00	**Plenary feedback**
16:00 – 16:40	Coffee
16:40 – 17:00	**Workshop summary and conclusions**

Annex 3: Participant list

Name	Organization	Country
Yves Maekelberg	Agency for Maritime and Coastal Services	Belgium
Hans De Veene	Federal Public Service Mobility and Transport	Belgium
Lukas Cicovacki	Ministry of the Sea, Transport and Infrastructure	Croatia
Stjepan Bilokapic	VTS Croatia	Croatia
Roman Poncar	Ministry of Transport	Czech Republic
Christian Kopp Pedersen	Danish Maritime Authority	Denmark
Keld Qvistgaard	Danish Meteorological Institute	Denmark
Martin Ahl	Defence Command Denmark - Naval Staff	Denmark
Alar Siht	Estonian Maritime Administration	Estonia
Ismo Siikaluoma	Finnish Border Guard	Finland
Markus Santasalo	Finnish Environment Institute (SYKE)	Finland
Patrick Eriksson	Finnish Meteorological Institute	Finland
Tuomas Taivi	Finnish Transport Agency	Finland
PhilippeBillast	Centre national d'études spatiales (CNES)	France
Franck Scher	Commandement interarmées de l'espace	France
Nicolas Maire	Department of Maritime Affairs	France
Rodolphe Bencze	French Customs	France
Sacha Bailly	French Navy	France
Vincent Pircher	Ministry of Environment, Energy and the Sea	France
Patrick Augier	Secrétariat général de la Mer	France
Ralf-Dieter Preuss	Federal Maritime and Hydrographic Agency (BSH)	Germany
Iris Ehlert	Contact Point for Copernicus National Marine Services	Germany
Michael Nyenhuis	German Aerospace Center (DLR) – Space Administration	Germany
Suman Singha	German Aerospace Center (DLR)	Germany
Panagiotis Anastasiou	Hellenic Coast Guard	Greece
Chrysavgi Kontogeorgou	Hellenic Coast Guard	Greece
Robert Kojnok	National Transport Authority	Hungry
Snorre Greil	Icelandic Coast Guard	Iceland
Halldor Zoega	Icelandic Transport Authority	Iceland
Ingibjorg Jonsdottir	University of Iceland	Iceland
Jerry Kelliher	Department of Defence	Ireland
Gerard O'Flynn	Irish Coast Guard	Ireland
Alan Osborne	Irish Coast Guard	Ireland
Gerry Smullen	Irish Coast Guard	Ireland
Patrick Harkin	Irish Defence Forces	Ireland
Michael Moran	Irish Defence Forces	Ireland
Tim McCarthy	Maynooth University	Ireland
Andrew Ryan	Revenue Customs	Ireland
Claudio Manganiello	Italian Coast Guard	Italy

Andrea Tassara	Italian Coast Guard	Italy
Antonio Vollero	Italian Coast Guard	Italy
Pietro Sofi	Italian Defence General Staff	Italy
Luca Bertocchi	Italian Navy General Staff	Italy
Giorgia Parca	Italian Space Agency	Italy
Patrizia Sacco	Italian Space Agency	Italy
Valters Zeizis	Latvian Environment, Geology and Meteorology Centre	Latvia
Atis Labucis	Latvian Institute of Aquatic Ecology	Latvia
Krists Dzenis	Maritime Administration of Latvia	Latvia
Mindaugas Cesnauskis	Lithuanian Maritime Safety Administration	Lithuania
Andrius Kairys	Regional Environmental Protection Department, Klaipeda	Lithuania
Sharon Bellzzi	Armed Forces, Malta	Malta
Richard Blundell	Malta Council for Science and Technology	Malta
Stephen Grixti	Malta Council for Science and Technology	Malta
Tom Kleinen	Netherlands Coast Guard	Netherlands
Hank Wessels	Netherlands Coast Guard	Netherlands
Tor-Inge Miljeteig	Norwegian Coastal Administration	Norway
Ståle Sveinungsen	Norwegian Coastal Administration	Norway
Sigurd Richardsen	Norwegian Directorate of Fisheries	Norway
Ingvild Skorve	Norwegian Ministry of Transport and Communications	Norway
Bogdan Rojek	Maritime Office, Gdynia	Poland
Cezary Puchacz	Ministry of Maritime Economy and Inland Navigation	Poland
Adam Maliszewski	Polish Border Guard	Poland
Nuno Miguel Da Silva Rosário	Coastal Maritime Traffic Control Centre	Portugal
Rui Tavares	Coastal Maritime Traffic Control Centre	Portugal
Carlos Ferreira	Directorate General of Natural Resources, Safety and Maritime Services (DGRM)	Portugal
Jose Gouveia	DGRM	Portugal
Jose Maciel	DGRM	Portugal
Nelson S. Marques	DGRM	Portugal
Vitor Ananias	Judicial Police	Portugal
Artur Vaz	Judicial Police	Portugal
Vitor Grilo	Maritime Police Headquarters	Portugal
Pedro Vinhas Silva	Maritime Police Headquarters	Portugal
Fernando Angelo	Portuguese Navy Fleet	Portugal
André Silva	Portuguese Navy Fleet	Portugal
Silviu Apostol	Romanian Naval Authority	Romania
Dumitru Bucuresteanu	Romanian Naval Authority	Romania
Alejandro Cervantes	Armada Espanola (Spanish Navy)	Spain
Emilio Martin Bauza	Departamento de Aduanas e II.EE (Spanish Customs)	Spain
Hernán Javier Del Frade de Blas	Directorate-General for Merchant Shipping (DGMM)	Spain
Alfonso Cabero M.	Guardia Civil	Spain
Beatriz Gomez	Guardia Civil	Spain

Miguel		
Vicent Beltran Vila	National Security Department	Spain
Antonio Notario	Prime Minister´s Office	Spain
Lourdes Ona	Spanish Maritime Safety Agency (SASEMAR)	Spain
Mats Borje	Swedish Agency for Marine and Water Management, SwAM	Sweden
Ulf Gullne	Swedish Maritime Administration	Sweden
Stefan Nilsson	Swedish Meteorological and Hydrological Institute (SMHI)	Sweden
Phil Bostock	Maritime and Coastguard Agency	United Kingdom
Peter Breger	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)	
Rui Meneses	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG GROW)	
Alexandru Chiric	Directorate-General for Maritime Affairs and Fisheries (DG MARE)	
Jacob Terling	Directorate-General for Mobility and Transport (DG MOVE)	
Bartel Meersman	EC-Joint Research Centre (JRC)	
Franco Oliveri	EC-Joint Research Centre (JRC)	
David Rios Morentin	EC-Joint Research Centre (JRC)	
Dirk Peters	European Defence Agency (EDA)	
Patricia Davies	European External Action Service (EEAS)	
Ezio Lama	European External Action Service (EEAS)	
Fredrik Lindblom	European Fisheries Control Agency (EFCA)	
Leendert Bal	European Maritime Safety Agency (EMSA)	
Pedro Lourenço	European Maritime Safety Agency (EMSA)	
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Gordon Campbell	European Space Agency (ESA)	
Umberto Del Bello	European Space Agency (ESA)	
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