European Maritime Safety Agency

Maritime Surveillance: Cooperation in Practice

Conference Proceedings

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EMSA

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List of Abbreviations

AIS	Automatic Identification System
ARTES	Advanced Research in Telecommunications Systems (ESA programme, under which the ESA-EMSA SAT-AIS initiative has been developed)
CFP	Common EU Fisheries Policy
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and Small and Medium Enterprises
DG MARE	Directorate-General for Maritime Affairs and Fisheries
DG MOVE	Directorate-General for Mobility and Transport
EASA	European Aviation Safety Agency
EC	European Community
EDA	European Defence Agency
EFCA	European Fisheries Control Agency
EMODnet	European Marine Observation and Data Network
EMSA	European Maritime Safety Agency
ESA	European Space Agency
EU	European Union
EUNAVFOR	European Union Naval Force ATALANTA
EUROCAE	European Organisation for Civil Aviation Equipment
EUROSUR	European Border Surveillance System
FRONTEX	European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union
IAP	Integrated Applications Promotion (ARTES 20 programme)
IMDatE	Integrated Maritime Data Environment
IMS	Integrated Maritime Services
JARUS	Joint Authorities for Rulemaking on Unmanned Systems
LRIT	Long Range Identification and Tracking (vessel position data based on telecommunication satellites)
MAOC-N	Maritime Analysis and Operations Centre – Narcotics
MRS	Mandatory Reporting System
MSS	EMSA's Maritime Support Services
RAPSODY	Remote Airborne Platform with Satellite Oversight DependencY (RPAS demonstration project)
RPAS	Remotely piloted airborne systems (the term is used synonymously with UAS, UAV and drone)
SAT-AIS	Satellite Automatic Identification System (AIS data transmitted by satellite)
SESAR	Single European Sky Air traffic management Research project
STEAM	Ship Sulphur Trail Emission Aerial Measurements (RPAS demonstration project)
UAS	Unmanned airborne system (see RPAS)
UAV	Unmanned aerial vehicle (see RPAS)
VDS	Vessel detection system (vessels identified on satellite images)
VDES	VHF data exchange system
VHF	Very high frequency (radio signals)
VMS	Vessel Monitoring System (tracking of commercial fishing vessels based on communications satellites)
VTMIS	Vessel Traffic Monitoring and Information System

1. Introduction

The European Maritime Safety Agency (EMSA), as a body of the European Union, sits at the heart of the EU maritime safety network and promotes collaboration between European and international institutions, member states' administrations, and other actors in the maritime domain. EMSA was established by Regulation (EC) 1406/2002, and subsequent amendments to the Regulation, most recently Regulation (EU) No 100/2013, have extended the range of tasks undertaken by the Agency, including in the field of supporting the Commission, Members States and other EU bodies to undertake maritime monitoring and surveillance activities.

To implement effective maritime policies, governments and institutions need detailed, reliable, evidence-based knowledge about what happens at sea, in real time. New and innovative technologies are increasingly available, leading to more comprehensive and effective maritime surveillance. As just one example, EMSA's systems are increasingly evolving in such a way that specific information can be selected, combined and integrated, and tailored to unique user needs (see appendix A for some examples of data sources). Similar developments are occurring at national level, and at other European and international organisations.

On 7 May, EMSA organised an afternoon conference entitled "Maritime Surveillance: Cooperation in Practice". The purpose of the conference was to bring together several key players at the forefront of maritime surveillance and to promote cooperation between interested sectors. It provided a forum for the exchange of new ideas and perspectives, and an opportunity for maritime authorities to be updated on recent trends and developments.

2. Welcome and opening (Markku Mylly, Executive Director, European Maritime Safety Agency)

Markku Mylly, Executive Director of the European Maritime Safety Agency (EMSA), opened the conference by explaining that the aim of the conference was to demonstrate the status of operational maritime surveillance activities at European level. Participants were invited in order to provide an opportunity for discussing user requirements, what is being done to address these and how cooperation at Member State and EU level is working towards this goal. Representatives of the European Parliament and European Commission were also invited, in order to provide insight into the policy objectives and expectations being faced at European level when talking about Maritime Surveillance, and representatives of European Union Member State and European bodies in order to share their needs and experiences in terms of practical and operational maritime surveillance services.

The theme of the conference, 'Cooperation in Practice', highlights the work being done by EMSA, working together with a number of different actors to foster technical and operational cooperation in this field. Within this context, the Agency strives to continuously improve and innovate to provide an even more complete maritime picture. Other agencies, such as the European Aviation Safety Agency (EASA) and the European Space Agency (ESA), were invited to describe the different areas where this ongoing cooperation is of particular relevance for maritime surveillance purposes. Europe is in an unprecedented era of maritime information, which can be used to support operational tasks. EMSA's Integrated Maritime Services are a tool for Member States and European bodies to make use of this information to their full advantage.

EMSA works by establishing technical cooperation with users at operational level. It is a bottom-up approach focussing on the needs expressed at an operational level. EMSA's objective is not to replace or substitute existing systems at Member State and EU level; but rather to build on what is available and to tailor services according to requirements expressed by users, thereby enhancing existing systems, applications and services. Avoiding duplication of data and information, and therefore of investments at EU level, is an important principle. Inter-agency cooperation (e.g. between EMSA and EFCA, Frontex, EUNAVFOR, and MAOC-N[1]) and use of existing EU funded services such as EMODnet (DG MARE)[2], can ensure that synergies are enhanced and duplication avoided. In this context, it is important to highlight EMSA's role in bringing together users, organisations and authorities, Member States and EU bodies, to share relevant information and knowledge for the benefit of all actors with tasks and responsibilities in the maritime domain.

EMSA's role in supporting maritime surveillance in Europe has been recognised, and the responsibilities of the Agency in this area extended, in particular through the revision of the Agency's Founding Regulation in 2013. Not only was the Agency entrusted with new fields of activities, but the existing tasks were enlarged and enhanced. This included a new mandate to provide vessel positioning and earth observation data in order to facilitate measures against threats of piracy and of intentional unlawful acts.

EMSA's continued involvement in this area is appreciated and supported by users, for example through the SafeSeaNet High Level Steering Group (the SafeSeaNet governance body), and approved by the Agency's Administrative Board in the context of the 5 Year Strategy and the Annual Work Programmes, as well as on a case-by-case basis for specific cooperation agreements. All conference participants were encouraged to contact EMSA with requests and ideas; the Agency will do whatever is in its capacity and mandate to help and support national and EU level maritime surveillance needs.

Mr Mylly ended by offering thanks to the speakers and to the audience for accepting the invitation and finding time in their busy agendas to take part in the conference and share their experiences, expectations and views.

[1] EMSA currently has cooperation agreements in place with the European Fisheries Control Agency (EFCA), the European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union (Frontex), the European Union Naval Force ATALANTA (EUNAVFOR), and the Maritime Analysis and Operations Centre – Narcotics (MAOC-N).
[2] The European Marine Observation and Data Network (EMODnet) is a long term marine data initiative from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE) underpinning its Marine Knowledge 2020 strategy. EMODnet is a consortium of organisations assembling European marine data, data products and metadata from diverse sources in a uniform way.

3. Maritime Surveillance from an EU Institutional Perspective (Ana Gomes, Member of the European Parliament)

Ana Gomes, Member of the European Parliament, thanked EMSA for the invitation to speak at the conference, and for the opportunity to put forward the position of the European Parliament. She explained that in the maritime domain, a more holistic approach is now necessary, which will require a broader realisation that civilian applications can have importance applications for defence purposes, and vice-versa. These synergies have not yet been assumed across the European Union, but are now being championed by the European Parliament, which stands at the frontline of many of the issues. These synergies will help foster maritime security and safety.

As the author of the 'Report on the maritime dimension of the Common Security and Defence Policy'[3], which was approved by a large majority in Parliament in September 2013, Ms Gomes has been active in bringing issues related to maritime security to the attention of the High Representative, the Council, and the Commission. She explained that she is a strong advocate within Parliament that Europe should develop a clear European maritime security strategy. The voting on the report revealed a high level of convergence on this issue from both left and right-wing mainstream parties.

Since 2013, Ms Gomes explained, Europe has become better equipped to embark upon such a strategy. There are clear declarations from Member States that they are now ready to jointly face challenges in the maritime domain. All countries depend upon the seas, and upon freedom of navigation; addressing the collective purpose of safety and security at sea is therefore fundamental in order to safeguard citizens, respect the rule of law, and ensure economic prosperity. However, this needs to be done by countries working together, and cannot be achieved by any country alone.

One area in which working together, and capitalising on synergies between the civilian and defence spheres is particularly important, is in addressing the threats posed by maritime crime: drug trafficking, arms smuggling, environmental risks, etc. To do this, it is important to recognise the connections between safety and security. One clear example is in anti-piracy activities; EMSA has been providing data in support of operations of the EU ATALANTA mission. EUNAVFOR, although a naval organisation, relies on data from non-naval sources. This cross-sectoral cooperation should be acknowledged, and its importance recognised. Building on synergies not only improves safety and security, the main priorities, but also saves money for the EU taxpayers.

A more analytical approach also needs to take into account the non-European dimension of the maritime crises being faced. It is to be hoped that the European Commission and the External Action Service provide a clear vision in this respect. Europe needs to work closely with partner countries too. The issue of migration in the Mediterranean in particular has reached a crisis point. To save lives and to combat smugglers and human traffickers, not only the civilian resources of coastguards are needed, but also the resources of the navies. The emergency situation which currently exists with regard to saving lives at sea in the Mediterranean is not a temporary crisis; it is a problem which is here to stay. It is also not a problem to be addressed by Malta or Italy or Greece in isolation; it is a European problem

Military and civilian resources should be mobilised, possibly in the context of a Common Security and Defence Policy mission in the Mediterranean. If resources can be mobilised for an operation in the horn of Africa against piracy, they should also be possible to mobilise in the Mediterranean. Pressure needs to be put on EU leadership to achieve this, making use of all instruments available. The resources of EMSA, jointly with that of other Agencies, should be harnessed for this purpose too.

[3] Report on the maritime dimension of the Common Security and Defence Policy [2012/2318(INI)], Committee on Foreign Affairs, Rapporteur: Ana Gomes

4. Maritime surveillance from an EU Institutional Perspective (Fotis Karamitsos, Deputy Director-General, DG MOVE)

Fotis Karamitsos, Deputy Director-General, DG MOVE, stated that the conference provided an excellent opportunity to discuss how best to further increase cooperation between organisations, especially in the context of using EMSA's services. He explained that for the European Commission, this is a positive but challenging period. The maritime data services at EMSA have been built up over recent years, and have come together now through on single platform. However, continued cooperation should be fostered in order to realise the full potential of these services. It is very positive that institutions with an interest in the maritime domain are now working together, and this stems partly from the changes to EU legislation, which promote maximising efficiency and avoiding duplication of efforts. The Vessel Traffic Monitoring and Information System Directive (VTMIS Directive, Directive 2002/59/EC as amended) in particular has been updated to reflect the changes which have occurred with regard to the EMSA systems and the capabilities of the Integrated Maritime Data Environment (IMDatE).

Enhanced cross-border and cross-sector cooperation needs to continue, including between national authorities and industry. The integrated system developed by EMSA already serves to exchange information via different domains, and for a range of monitoring and surveillance purposes. It will also link with the soon-to-be-implemented national single windows. This was not the creation of a system for the sake of having a system; it is used extensively in practice, and provides situational awareness for a number of purposes, including fisheries control, defence, maritime security and safety, customs, general law enforcement, marine environment protection, places of refuge, etc. This system is encompassing, and is provided as a single system under EU law. It is offered to all EU Member States, and is used by other EU agencies and bodies, including EFCA, EUNAVFOR, Frontex and MAOC-N.

Mr Karamitsos highlighted that a current issue of major concern is search and rescue. Europe is currently witnessing a new type of migration. This is, first and foremost, a humanitarian issue. Extreme situations are created by people smugglers, who rely on the fact that the people they traffic will be rescued by search and rescue operations. Combating this problem requires a different type of cooperation in Europe, and, in particular, further cooperation between authorities exercising coast guard functions. The best way forward to organise collaboration between authorities exercising coast guard functions at national level is through the EU agencies and through the use of integrated maritime services. Mr Karamitsos observed that EMSA, as an agency which is already active in most of these areas, and with experience of working with other agencies, is ideally placed to promote this type of cooperation. He suggested the possibility of creating a coordination cell to complement other cooperation efforts which exist. Such a coordination cell would concentrate on issues of maritime safety, and draw on the many tools already available in EMSA and elsewhere. This would bring added value by building on existing work, whether in capacity building, sharing of assets, or other areas.

On the civilian side, the Commission is making additional efforts and funds available. The existing system, and in particular the Satellite and Satellite Radar component (CleanSeaNet), will be further enhanced. This is the main system to be used for the operational implementation of the Security Services under the COPERNICUS programme. Support by EMSA to the Commission is to be given specifically for the maritime surveillance component of the security services.

Mr Karamitsos stated that he was looking forward to hearing more about future developments in relation to the EMSA services, including increased Earth Observation options, and activities using Remotely Piloted Airborne Systems (RPAS) data. These data sources, used together, will further Europe's capacity to identify smaller vessels which are not sending out automatic identification (AIS) messages. Satellite and RPAS data combined can provide a more complete picture.

There is a need to solve problems in new ways, and to think outside the box, in particular in relation to the problem of migration by sea. To address this problem will also require the institutionalisation of cooperation, and a move beyond current capacities. This will include harnessing new means, whether through the use of civil RPAS, or promotion of cooperation in the area of European Coast Guard functions. The future potential for a European Coast Guard could be considered.

The speech concluded with the observation that Europe must not lose this opportunity to improve joint capacity to protect human lives. With the critical situation at the borders, cooperation needs to be further developed between European Agencies, and particularly between European Agencies and those authorities undertaking coast guard activities. Finally, Mr Karamitsos added that he had a great appreciation for the work done by all the organisations present in the room.

5. Importance of maritime surveillance for fisheries control (Pascal Savouret, Executive Director, European Fisheries Control Agency)

Pascal Savouret, Executive Director, European Fisheries Control Agency (EFCA) provided a brief background summary of the Agency and its activities. It is a European Union body established in 2005 to organise operational coordination of fisheries control and inspection activities by Member States and to assist them to cooperate so as to comply with the rules of the Common EU Fisheries Policy in order to ensure its effective and uniform application. The Common EU Fisheries Policy (CFP) is a set of rules for managing European fishing fleets and for conserving fish stocks, not just in the EU, but worldwide. One of the main CFP policies is fisheries management, which requires strong input from the Member States on a range of activities, such as monitoring fishing areas, controlling licenses and permits, ensuring quotas are adhered to, etc.

In this legal and operational context, EFCA makes use of the Integrated Maritime Data Environment (IMDatE). Given the massive number of vessels entering and leaving the fishing areas, maritime surveillance is important, Until recently, the only means for monitoring fishing vessels was through Vessel Monitoring System (VMS) data, sent via satellite. Position report messages are sent with a relatively low frequency, every two hours; however, depending on conditions, occasionally messages might only be received once every 4-6 hours. The system is also dependent on the goodwill and cooperation of the skipper. Most inspectors with some experience will have come across instances when the system has been manipulated.

Mr Savouret explained that working with EMSA has increased the range monitoring tools available to EFCA by providing access to data sources such as terrestrial and satellite AIS, and long range identification and tracking data (LRIT). This is integrated with VMS information, creating more complete vessel tracks. With frequent position reports, it is possible to identify different types of fishing activity, and well as determine more accurately the location, course, and speed of vessels. The presentation displayed an example of a vessel track, firstly with information derived only from VMS, then with information derived from more sources (figure 1). With the expertise in-house in EFCA, it is possible to determine from the integrated track the type of fishing behaviour which is being undertaken, and monitor more closely the behaviour of the vessel.

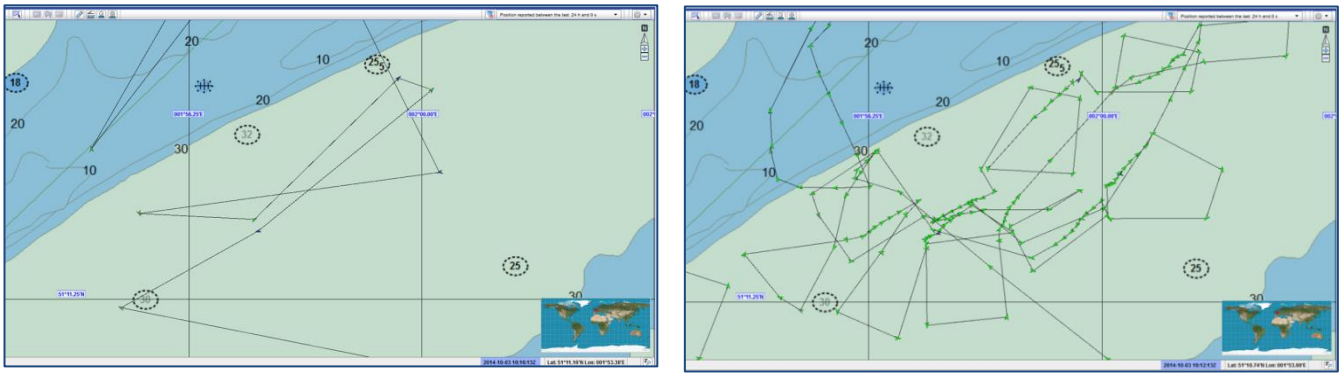


Figure 1 The same vessel track: with only VMS data displayed (left) and with combined data displayed (right)

Another major challenge is monitoring static gear. The use of static gear is regulated (technical measures), and some static gear can only be used at certain depths. However, in practice it can be problematic, because technical inspection at sea is cumbersome (due to mesh size and length; gear can be several kilometres long), and it is difficult to detect the gear and establish dimensions visually. IMDatE can assist in determining the length of nets, and the depths at which fishing activity occurs. The combination of vessel position and depth can provide more complete information on what a vessel is doing. Integrated services are also used for identifying possible infringements in in relation to monitoring Blue Fin Tuna fisheries in the Mediterranean. Blue fin tuna fishing operations are fast and complex, involving several different vessels. In the image below, it is possible to see that two tugs each towing a cage encounter at sea. One tug continues with both cages, while the other speeds up and changes course.

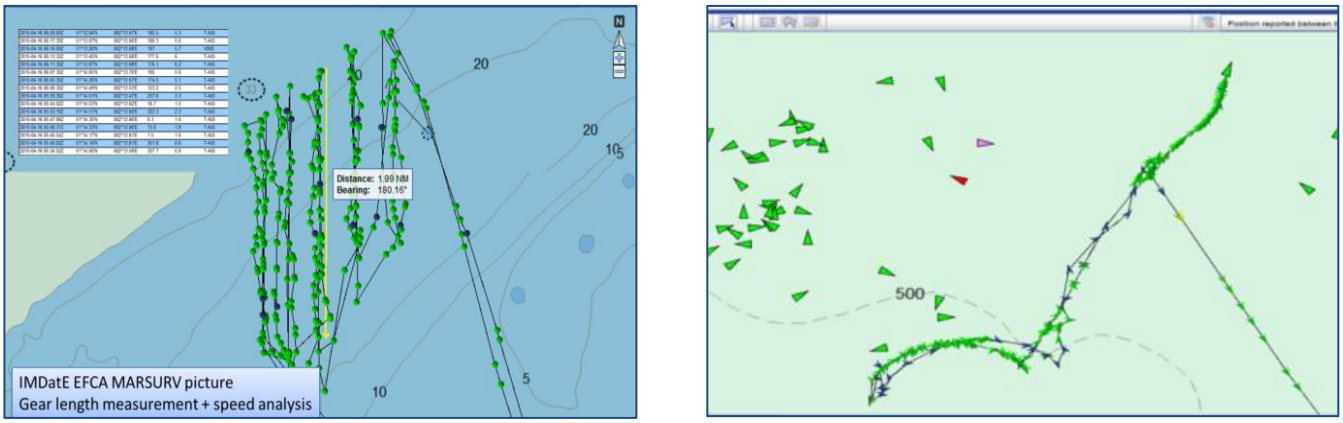


Figure 2 Examples of fishing behaviour: using static gear (left) and blue fin tuna fishing (right)

Use of IMDatE has enabled improved monitoring and targeting. Automated correlation of various datasets provided by different user communities has resulted in a more focused detection of possible cases of non-compliance. In future, EFCA is interested in further developing monitoring capabilities in the context of inter-agency cooperation projects through use of Vessel Detection System (VDS) data, Remotely Piloted Airborne System (RPAS) technologies, and further exchange of surveillance information.

Mr Savouret emphasized the importance of the very fruitful cooperation in place between Frontex, EMSA and EFCA. He stated that EFCA would also like to ensure that VMS data is available to support the projects undertaken by partner agencies, including for example EUROSUR, and in the context of search and rescue. However, a more solid legal basis for sharing VMS information would be helpful. The Commission and Member State representatives should recognise that there are a number of restrictions to exchanging data, and do whatever is possible to make this exchange easier.

6. Live demonstration of IMDatE

The live demonstration of the IMDatE platform was prefaced by a short introduction to review the integration objectives set by EMSA before deciding to proceed with the development. Since 2010, the Agency has been working on combining data from the different systems, in order to strengthen the services offered by each of them individually, and to provide the option of accessing services together. Without replicating replicate existing specialized capabilities, EMSA wanted to provide users with the following benefits:

- all maritime data from the existing EMSA applications and other sources combined in a –as complete as possible- maritime picture;
- a single screen with configurable (flexible) set-up or system-to-system link;
- harmonised horizontal services and data (user management, ship particulars, common data registries, etc).

In order to achieve this, a considerable amount of work has gone on behind the scenes; for example, there is a complex matrix of users – over 5,000 users of the various different systems - who all have different access rights and different data requirements. There is no 'one size fits all' solution, as was illustrated effectively by the EFCA presentation. Each user has different needs, and although many data sets are provided by EMSA, these are often presented in a particular way, or fused with other external data sources, in order to make each service directly relevant to the task for which it was created.

The process of developing integrated services began in 2010; the first operational version was made available in 2013; now, in mid-2015, there are 16 Member States and six EU organisations using IMDatE operationally. It is no longer a pilot service, but fully operational, with 24/7 support provided by EMSA.

During the live demonstration, the conference participants were introduced to some of the main features of IMDatE. Different data streams were added and removed, colour coding of vessels was explained, historical vessels tracks were displayed, and identification of polluting vessels through correlating information from satellite images and vessel tracks was demonstrated. The example of the EUNAVFOR service was used to show how risk information from a user can be included in the IMDatE display.

An overview was also given of the tablet version of the IMDatE user interface, which is currently under development. Although some applications are heavy, and need to be accessed on a desktop, there are others for which it is useful and possible to have a lighter version which can be accessed via a tablet or phone. This would be the case if visiting vessels in port, going aboard for an inspection, or taking part in a search and rescue operation, for example. Much of the same information is available, but an emphasis has been put on simplicity; the searches are easy, and the information is shown in a basic way – for example, oil spills are shown as red marks, but the actual SAR satellite images are not displayed on the screen, as this would be too resource intensive. The mobile application (iOS and android for phone and tablet) will be rolled out and tested in the near future, and then, if successful, will be made available to all interested Member State users.

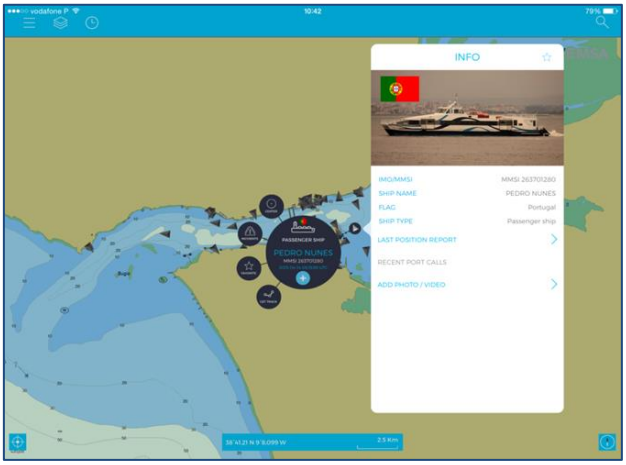


Figure 3 User interface of iPad version of IMDatE

7. New technologies: RPAS activities (Luc Tytgat, Director of Strategy and Safety Management, European Aviation Safety Agency)

Luc Tytgat, Director of Strategy and Safety Management, European Aviation Safety Agency (EASA), began his presentation by noting that there are a number of areas of overlapping interest between EMSA and EASA: in particular, there is currently considerable interest on the part of both agencies in the potential of Remotely Piloted Airborne Systems (RPAS). RPAS are often seen as a cheaper solution than aircraft for undertaking similar tasks, or as a complement to aircraft. In terms of monitoring, different types of technologies can be used together to provide a broader overview of activities. Developments in practice and capacity are now prompting institutional changes to regulations and legal frameworks, and driving technological changes in related areas, for example in satellite communications technology for controlling RPAS and getting real time information when RPAS are flying at a distance from the coast.

Issues related RPAS were not really a consideration at the time that EASA was being established. This is now changing, and the Agency is evaluating what needs to be done, and planning how to proceed, initially with interim solutions and then more permanent ones. The Agency is competent for RPAS with a Maximum Take-Off Mass above 150 kg that are not used for military, customs, police, search and rescue, firefighting, coastguard or similar activities or services, and that are not specifically designed or modified for research, experimental or scientific purpose to be produced in very limited numbers. Currently an interim policy is in place which is used by the Agency's staff when certificating RPAS/Unmanned Airborne Systems (UAS)[4].

To provide some more of the industrial and social context, this is a fast developing activity, in particular for small RPAS with multiple applications. Rules, where they exist, are not yet harmonised. This is a wide range of machines, and expanding use of new technologies, largely being developed by universities and small and medium enterprises, sometimes in the context of industries with no background in aviation. The pressure from users for regulations is high, and adapted regulations are to be developed in an international context[5]. The attitude of the general public to RPAS is favourable, although there are concerns related to safety, security and privacy.

Recent decisions in Europe stem from the Commission Communication 207/2014[6]. This advocates a performance-based approach, which is intended not to be too restrictive. RPAS operators will have to show that they have assessed all risks, and the national authorities involved will ensure that safety measures have been covered.

The conclusions of the EU Council of Transport Ministers following the meeting of the Transport, Telecommunications and Energy Council on 13 March 2013 were as follows:

- On the overall objective of integration of RPAS into the aviation system, there was consensus that RPAS need to be integrated in the European airspace.
- On the substance of the future regulation and how to keep rules proportionate to risk, all interventions favoured a common level playing field with harmonized rules.
- With regard to safety, security, privacy and data protection challenges, it was agreed that concerns of citizens with regard to these issues are very important – but can be managed within the existing regulatory framework at the national level.

At the Riga summit on RPAS, 5-6 March 2015, there was political buy-in of all Member States. Consensus in Europe has been very important for ensuring progress on this issue. The main conclusions of the summit were that: RPAS need to be treated as a new type of aircraft, with proportionate rules based on the risk of each operation; EU rules need to be developed now; technologies and standards to be developed for full integration in European Airspace; public acceptance is key to the growth of RPASservices; the operator of a RPAS is responsible for its use.

[4] Policy E.Y013-01, 'Airworthiness Certification of Unmanned Aircraft Systems (UAS)'. The policy represents a first step in the development of comprehensive civil UAS regulation and provides guidance to Part 21 Subpart B of Regulation (EC) No 1702/2003: Type-certificates and restricted type-certificates. It is an interim solution to aid acceptance and standardisation of UAS certification procedures.
[5] For example, in the context of the Joint Authorities for Rulemaking on Unmanned Systems (JARUS) and the International Civil Aviation Organization (ICAO).
[6] Communication from the Commission to the European Parliament and the Council, 'A new era for aviation: opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner', COM(2014) 207.

EASA therefore now has the mandate to draft an Impact Assessment on RPAS integration, to draft amendments to the basic regulation in order to enable future specific rulemaking on RPAS, and to develop a Concept of Operations reflecting a proportionate and risk based approach to regulation. The Concept of Operations being developed by EASA is a regulatory concept which is proportionate, progressive, risk based, and promotes high level rules complemented by industry standards. EU rules will cover all RPAS, and commercial and non-commercial RPAS will be treated in the same manner.

RPAS will grouped into three categories: open, specific and certified (see figure 5). The open category covers small RPAS for which local authorities are solely responsible. The specific category covers RPAS which are being developed for defined applications, such as border control or maritime surveillance, for which the operator will need to approach the relevant national authority with supporting documentation such as a risk assessment and safety case. The certified category covers other types of RPAS, and will require that the operator applies to EASA for certification (analogous to an airplane).

However, Mr Tytgat explained that developments in Europe cannot occur in isolation; decisions have to be made in conjunction with other international organisations. EASA currently has chairmanship of the international regulatory group, Joint Authorities for Rulemaking on Unmanned Systems (JARUS), which is particularly important as a reference group for regulation of RPAS internationally. At the JARUS plenary meeting in April 2015, the EASA concept of operations was adopted, and prioritisation of JARUS activities were agreed accordingly.

To organise work in Europe, an EU implementation coordination group has been set up, with the scope to better organize and synchronize the efforts in Europe regarding the implementation of the concept of operations and overall RPAS integration. Current membership comprises the European Commission (DG MOVE and GROW), EUROCONTROL, EASA, JARUS, SESAR, the European Defence Agency (EDA), the European Organisation for Civil Aviation Equipment (EUROCAE), the Unmanned Vehicle Systems Association (UVS International), and industry partners. There is also considerable activity being undertaken via the Single European Sky Air traffic management Research project (SESAR), a collaborative project to overhaul European airspace.

Mr Tytgat also highlighted future challenges: there is a need to re-focus JARUS, and organise industry and military participation in JARUS; availability of budget and resources is always an issue; buy-in from all involved parties is important; there are strong expectations from stakeholders and applicants; finally, new problems may arise for example related to privacy, cyber-security, enforcement, or data from military partners.

The roadmap for EASA over the coming year has been decided. Mr Tytgat explained that the Agency aims to draft text for the basic regulation, undertake an impact assessment and stakeholder consultations, and, by December 2015, propose a regulatory framework and concrete regulatory measures to the Commission.

Figure 4 Proposed RPAS categories

8. ESA's contribution to space technology for maritime surveillance (Anmon Ginati, Head of Telecommunication and Integrated Applications, ESA)

Anmon Ginati, Head of Telecommunication and Integrated Applications, the European Space Agency (ESA) began his presentation by providing some background information on ESA, describing how, over a number of decades, ESA has been at the forefront of science and robotic exploration. ESA has done this largely by supporting new and innovative developments as potential emerges.

One of the main initiatives of recent years, which will have a significant impact on surveillance activities in the maritime domain, is the launching of the Sentinel family of satellites. Once complete, this will be the world's most comprehensive suite of Earth Observation satellites. Sentinel-1, which was launched in 2014, is a polar-orbiting, all-weather, day-and-night radar imaging mission for land and ocean services. It will provide services to EMSA's oil spill monitoring and vessel detection service, CleanSeaNet.

ESA is also investing in new telecom programmes and integrated applications, including in the area of satellite Automatic Identification System (AIS) data. ESA, in partnership with EMSA, is supporting the use of satellite AIS data to meet the requirements of users, particularly those of government agencies such as maritime administrations, in the area of identification and tracking of vessels globally. A satellite AIS Data Processing Centre has been developed by ESA and EMSA, through the ARTES programme[7]; this now forms part of the Integrated Maritime Data Environment (IMDatE), an advanced data processing platform operated by EMSA for the delivery of integrated services. Satellite AIS data is currently being procured through a public–private partnership with commercial providers, which has recently been extended to ensure data will be available to users until August 2016.

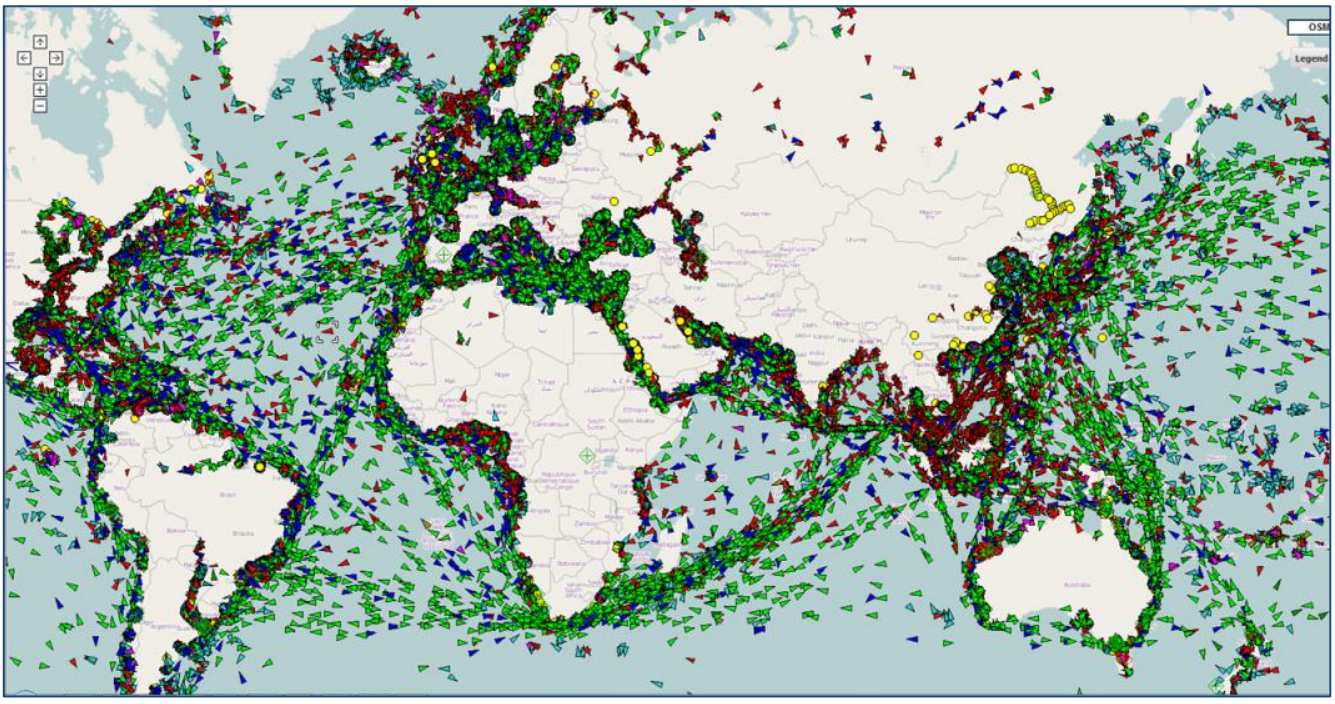


Figure 5 Global vessel positions, including satellite AIS data

[7] The SAT-AIS Data Processing Centre was developed through ESA's Advanced Research in Telecommunications Systems (ARTES) programme, element 20 - Integrated Applications Promotion. The purpose of the ARTES programme is to explore innovative concepts to produce leading-edge satellite products and services. ARTES applies to many different satellite communications project areas, also termed 'elements' of the programme. ARTES element 20, the Integrated Applications Promotion (IAP), is dedicated to the development, implementation and pilot operations of Integrated Applications. Other aspects of the ESA-EMSA cooperation have been supported by ARTES element 21 - SAT-AIS.

This satellite AIS data is not only useful for tracking ship movements, but also for combining with other data. Just a few examples of how this data can be used include:

- Overlaying vessel tracks on earth observation satellite images displaying possible oil spills. This facilitates the identification of possible polluters.
- Tracking of a specific category of vessels (such as vessels engaged in Short Sea Shipping in the European Union), e.g. to confirm whether a ship has come directly from another European port or from outside Europe. This can be useful in determining administrative obligations and level of customs inspections.
- Monitoring vessels of interest, as occurred in a recent cocaine trafficking case (vessel M/V Winner).
- Combining Vessel Detection Services (VDS, the detection of vessels on synthetic aperture radar images) data with vessel position reports, to identify vessels in an area that are not transmitting position messages.

There is huge potential for future improvements to maritime surveillance, explained Mr Ginati, through the use of integrated satellite applications. ESA's Integrated Applications Promotion (IAP) Programme aims to develop integrated applications for new user communities, based on actual user demand. A recent successful example, initiated through the IAP programme, was the FlySafe project, addressing birds and flight safety. Maritime navigation and safety is one of the thematic areas defined by ESA for activities through the ARTES programmes and missions, and is also one of the areas in which there is most activity planned through the IAP programme. The strategic partnership with EMSA is very important for ESA in this respect, as EMSA has a direct relationship with operational users and is able to communicate requirements from maritime users to ESA. This is currently the case for existing satellite services, and will be important in future in emerging areas of interest such as Remotely Piloted Airborne Systems (RPAS) services and the VHF Data Exchange System (VDES).

In terms of RPAS, there has been considerable interest in the idea of integrating new data in the maritime picture, possibly through the medium of an inter-agency business model. Multi-purpose RPAS operations providing services of joint interest through the same platform could prove to be a cost effective way of enabling end users to benefit from new data streams. This idea will be explored further.

With regard to VDES, a growth in AIS use has caused an increase in VHF data link loading. The maritime community has proposed, as a solution, that additional VHF channels be allocated for this purpose, which will require a new data exchange system (VDES). VDES enables information transfer between terrestrial stations and satellites to allow for higher speed digital data exchange with potential for a worldwide coverage. ESA and EMSA will initially explore the user needs and required services that could potentially be provided by VDES.

Mr Ginati reminded informed participants that they should note two important upcoming events: a workshop on maritime related RPAS activities (28 October 2015) and the first EMSA-ESA VDES user requirements meeting (29 October 2015). Both events will be hosted at EMSA's premises in Lisbon.

9. EMSA's further development of maritime surveillance capabilities (Leendert Bal, Head of Operations, EMSA)

The final presentation of the day was delivered by Leendert Bal, Head of Operations, European Maritime Safety Agency (EMSA). He introduced the most recent and innovative activities at EMSA, with the intention of keeping EMSA's service users and interested parties informed of new developments. EMSA needs new data input and to improve the systems to provide the best possible maritime picture available.

Mr Bal explained to participants that EMSA is currently interested in exploring the capabilities of Remotely Piloted Aircraft Systems (RPAS). Satellites in orbit have a number of limitations, including for example that they are not stationary, and that it can be difficult to focus on a smaller target such as a non-reporting vessel. RPAS have the potential to fill some of the existing gaps. The Agency's objective is therefore to better understand the potential of RPAS as an additional data source to improve the overall maritime picture. EMSA is at the initial stages of engaging in pilot projects and activities, including the ESA project 'RAPSODY - Remote Airborne Platform with Satellite Oversight DependencY', which focuses on maritime surveillance applications, and the ESA project 'STEAM - Ship Sulphur Trail Emission Aerial Measurements', exploring emission monitoring (sulphur content from ship fuels). EMSA is also involved in technical cooperation with the Portuguese Air Force for small-scale tests of data transmission, usage of data formats, and data integration. A dedicated workshop will be organised at EMSA on 28 October 2015 to present in general all ongoing maritime related RPAS research activities.

There are currently a number of initiatives being developed with the aim of obtaining a wider range of satellite data. The agreement with ESA to provide a global satellite AIS data feed to users of integrated maritime services has been extended to 31 August 2016. Testing will soon start, for a six month period, using video data from satellites. New contracts are being finalised to obtain earth observation data from even more providers. Finally, EMSA has contracted access to ground stations outside the EU, for faster access to data from around the world (which could be useful in a number of contexts, including monitoring French overseas territories).

The mobile application, which was demonstrated live during the earlier part of the conference, will be tested in 2015 with operational users, initially the Dutch Coast Guard, the Maltese Fisheries Control Authority, and the Maritime Analysis and Operations Centre – Narcotics (MAOC-N). If successful, the service will be rolled out to all interested EU Member State authorities and EU bodies.

In order to provide high quality and reliable services, particularly in an environment in which more data sources are continually being added and there is ever-increasing demand for services from a wide variety of users, EMSA needs to undertake system capacity upgrades. There is a lot of work going on at EMSA behind the scenes to prepare for the next generation of services. The Agency is planning for improvements in the integration of systems and fusion of data; ensuring, with ESA that there is data processing capability for validating satellite AIS data (Doppler); improving automated vessel anomaly behaviour detection; and paving the way for the addition of meteorological-oceanographic data as layer in the Integrated Maritime Data Environment (IMDatE).

All this is in accordance with the longer terms goals of EMSA, as defined in the Agency's 5 year strategy: to increase the effectiveness and efficiency of EMSA's integrated maritime information service to its full potential; and to explore, at reasonable cost, in a sustainable and viable way, new capabilities offered by technology in the field of maritime surveillance.

10. Review and closing address (Markku Mylly, Executive Director, EMSA)

In the final address, Markku Mylly summarised the key points derived from the presentations and discussions during the course of the conference.

With regard to the current situation of maritime surveillance in practice across Europe, it was concluded that:

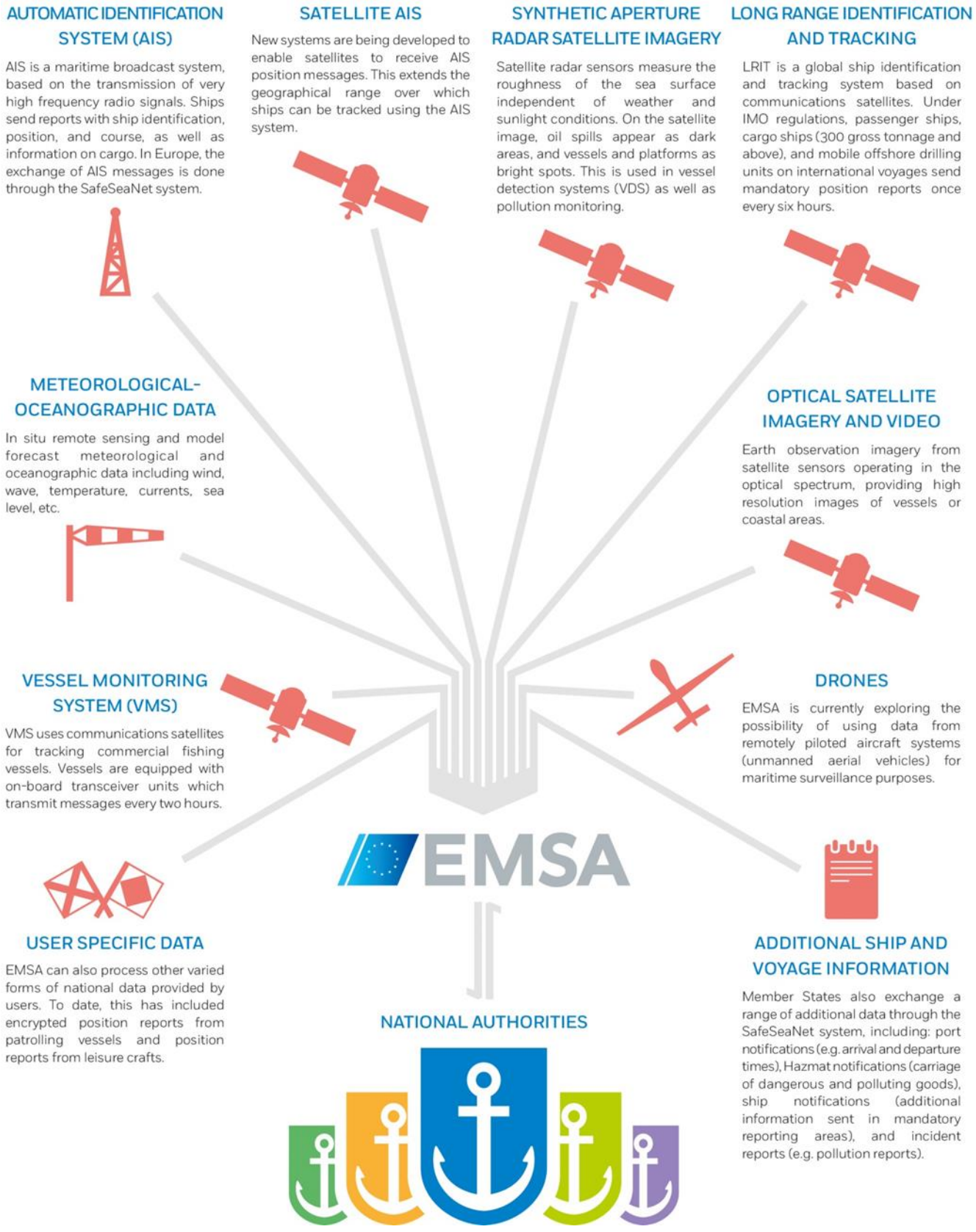
- Member States are engaged in an increasing number of sea-based activities, and have a growing need for reliable maritime data;
- The systems to deliver a “maritime picture” exist;
- Inter-agency and Member States’ cooperation is growing: there is increasing trust between the actors involved;
- The bottom-up approach adopted has delivered good results.

Some areas of maritime activity are subject to increasing levels of political activity. This includes particularly immigration issues in the central Mediterranean sea, and the shift in piracy activity from East to West Africa. New policy initiatives are emerging which aim to address issues such as these, including the EU Maritime Security Strategy, amongst others.

It is clear that inter-agency cooperation is essential for effectively delivering maritime information services and for developing new capabilities. This is an iterative process in which the agencies find synergies, and build on each other’s strengths to deliver improved services to all end-users. There is still scope for Member State authorities to make better use of EMSA’s capabilities. Users and potential users should be aware that support is available to help them, whether through introducing users to new services, or supporting them through training to make the best use of the available services. It is through listening to users that the services can be tailored and improved; an operationally based bottom-up approach is successful in ensuring that services are relevant and deliver what is needed.

Finally, the practical contribution of EMSA in future will essentially be to strengthen the services available: EMSA will work closely with users on future developments to IMDatE; more data will become available and new innovative applications will be added to Integrated Maritime Services; system upgrades and new services will be discussed with Member States and the Commission. Improvements will be made in a planned and coordinated manner, taking into account actual developments at sea and the emerging priorities of Member States and the Commission.

Appendix A Data Sources



Data sources: one of the main attributes of integrated maritime services is the ability to combine information from a range of different data sources, greatly enriching the maritime domain awareness picture.

Appendix B Conference Agenda

Maritime Surveillance Conference: Cooperation in Practice

Conference Agenda

Thursday, 7 May 2015: Afternoon

Chair: *Leendert Bal, Head of Operations,* EMSA

Time	Agenda Item	Speakers
13:40 – 14:10	**Registration and coffee**	
14:15 – 14:30	1. Welcome and opening *Markku Mylly, Executive Director*	EMSA
14:30 – 14:45	2. Maritime surveillance from an EU institutional perspective *Ana Gomes, Member of the European Parliament*	European Parliament
14:45 – 15:00	3. Maritime surveillance from an EU institutional perspective *Fotis Karamitsos, Deputy Director-General*	EU Commission - DG MOVE
15:00 – 15:15	4. Importance of maritime surveillance for fisheries control *Pascal Savouret, Executive Director*	EFCA
15:15 – 15:40	**Coffee break**	
15:40 – 16:00	5. Live demonstration of IMDatE	EMSA
16:00 – 16:15	*6.* New technologies: RPAS activities *Luc Tytgat, Director of Strategy and Safety Management*	EASA
16:15 - 16:30	7. ESA's contribution to space technology for maritime surveillance *Anmon Ginati, Head of Telecommunication and Integrated Applications*	ESA
16:30 – 16:45	8. EMSA's further development of maritime surveillance capabilities *Leendert Bal, Head of Operations*	EMSA
16:45 – 17:15	9. Open discussion	
17:15 – 17:30	10. Review and closing address *Markku Mylly, Executive Director*	EMSA
17:30	11. Cocktail and networking	

Appendix C Participant List

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