【欧州】【海事】

Maritime Issues - Utilisation of drones: EMSA prepares for further support of RPAS surveillance operations and introduces new satellite communication services

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【概要：Summary】

In areas of dense maritime traffic, ship emissions like sulphur oxides (SO_x), nitrogen oxides (NO_x), carbon dioxide (CO_2) and particulate matter (PM) can be substantial and are harmful to human health and the environment. The introduction of new sulphur limits in SECA/ECAs in 2015 and at global level in 2020 led to the necessity to monitor and control the compliance with these new limits and led to an increase of maritime surveillance capabilities of the EU's Port State Control authorities.

The European Maritime Safety Agency (EMSA) supports the Member States in this task, by providing unmanned, Remotely Piloted Aircraft Systems (RPAS) for surveillance and inspection of the compliance with the sulphur limits in ECA/SECAs, as well as in all other marine areas of EU waters. Under the EU's inspection regime, RPAS allow for a reduction of sampling frequency by half to ensure compliance with the new sulphur limits inside and outside ECAs/SECAs, as it allows remote sensing of sulphur levels in the smoke emissions of ships. In fact, RPAS are equipped with gas sensors ("sniffers") to make measurements of the amount of SO_x versus the CO_2 in a ship's emission plume. Under EMSA's RPAS services, EU Member States can use RPAS free of charge for the surveillance of the SOx emission limits within ECAs and also in non-ECAS areas.

Since the RPAS utilisation has gained more importance in the testing of compliance of ship emissions with the introduction of the global sulphur limit, EMSA intends to further extend and improve its support of the maritime RPAS surveillance operations in the EU Member States and prepares measures for the support of next generation of RPAS services. Therefore, EMSA recently awarded six contracts for satellite communication (satcom) services, which are expected to provide fast and effective communications for guaranteeing accessible, secure, and autonomous satellite communication services. These new services will be applied to the current but also to the next generation RPAS services, thereby supporting the monitoring and improvement of surveillance of compliance with the SO_x limits in the EU's ECAs/SECAs and all other marine areas.

【記事：Article】

1. The introduction of IMO's sulphur emission limits in the EU

The reduction of SO_x, NO_x or CO_2 emissions from maritime transport has gained an increasing importance in the EU, as well as at global level.

Based on the International Maritime Organisation (IMO)'s 2008 amendments to Annex VI of the "International Convention on the Prevention of Pollution from Ships", MARPOL 73/78, a 0.1% sulphur limit for marine fuels in Emission Control Areas (ECAs) and Sulphur Emission Control Areas (SECAs) was introduced as of 2015. Furthermore, a new general sulphur limit of 0.5% m/m (percentage mass of sulphur dioxide gases in the total mass of the emission) replaced the formerly applied 3.5% limit at global level for all areas outside ECAs/SECAs as of 1 January 2020. The reductions of the sulphur contents in marine fuels are expected to significantly reduce SO_x emissions, and therefore have a beneficial impact on the environment and on human health.

In the EU, Directive 2012/33/EC transposed the limits of the IMO's sulphur provisions of the MARPOL Annex VI on the maximum sulphur content of gas oils, heavy fuel oil as well as marine fuels into EU law. Since 2015, the 0.1% sulphur limit applies in the EU's SECAs of the North Sea and English Channel, and the Baltic Sea. In 2016, the Directive 2012/33/EU was repealed by "Directive (EU) 2016/802 of the European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels". Article 6 of Directive (EU) 2016/802 stipulates that Member States shall take all necessary measures to ensure that marine fuels are not used in the areas of their territorial seas, exclusive economic zones and pollution control zones if the sulphur content of those fuels by mass exceeds 0,50% as from 1 January 2020 and in SO_x Emission Control Areas if the sulphur content of those fuels by mass exceeds 0,10% as from 1 January 2015 (Directive (EU) 2016/802).

Furthermore, in 2016, the European Commission tightened the EU's inspection regime to ensure compliance with the new sulphur limit (Decision (EU) 2015/253). The European Commission implementing Decision (EU) 2015/253 lays down the rules concerning the sampling and reporting of the sulphur contents of marine fuels under Council Directive 1999/32/EC as regards the sulphur content of marine fuels. It includes the requirements regarding the monitoring and controlling of the sulphur limit inside and outside the SECAs in the EU (Decision (EU) 2015/253). The EU Member States are required to carry out inspections of ships' logbooks and bunker delivery notes (BDN) on at least 10% of the total number of individual ships visiting the relevant Member State per year (Decision (EU) 2015/253). The verification of compliance should be carried out either through obtaining and analysing a fuel spot sample from the ship's fuel service system, or by analysing the relevant sealed bunker samples on board. This procedure is applied to at least 40% of cases out of the mentioned minimum 10% of ships inspected in EU Member States fully bordering SECAs, 30% in Member States partly bordering SECAs and 20% in Member States not bordering SECAs (Decision (EU) 2015/253). As of 1 March 2020, ships without scrubbers are not even allowed to carry marine fuel exceeding 0.50% in their fuel tanks, simplifying the enforcement, as authorities only need to prove that the ship is carrying a non-compliant fuel.

2. The surveillance of the sulphur content of the marine fuels and EMSA's services

With the introduction of the new sulphur limits of 0.1% in ECAs/SECAs as of 1 January 2015 and the global sulphur limit of 0.5% at global level as of 1 January 2020, compliance with the new sulphur limits had to be monitored and controlled. Since compliance is controlled by the individual State Party (IMO 2019) and the IMO does not set fines or sanctions, EMSA, and the authorities in every involved EU Member State have to control the enforcement of the sulphur limits and introduce surveillance methods. Already in 2015, the Danish Ship-owners' Association (DSA) had expressed its concerns regarding possible unfair

competition advantages of some ship-owners, due to their intentional non-compliance with the low-sulphur rules in SECA/ECAs (EMSA 2019).

Furthermore, the introduction of the global sulphur cap of 0.5% has put all coastal states under the obligation to enforce the new global sulphur limit as from 1 January 2020.

Based on the Commission Implementing Decision (EU) 2015/253, also in EU Member States not bordering SECAs, the sulphur content of the marine fuel on board of ships is also inspected in at least 30% of cases of 10% of the total number of individual ships calling in the relevant Member State per year. The full scope of fuel testing requirements had to be put in place and applied by the port authorities to secure a correct enforcement of the sulphur limits in ECAs (0.1%) and beyond, in the entire EU waters for the control of the global 0.5% sulphur content cap (Directive (EU) 2016/802).

The EU's new control regime of sulphur limits in ECA/SECA zones based on the European Commission's implementing decision represents "a significant step change" in the demand on Port State Control, which has to undertake more fuel sampling and testing compared to pre-2016 (Decision (EU) 2015/253). Under the Commission Implementing Decision (EU) 2015/253, the EU Member States authorities are requested to carry out also more sampling regarding the compliance with the sulphur limits of 0.1% in ECAs/SECAS and 0.5% at global level. There is no doubt that for countries with a high volume of shipping traffic, the new fuel testing requirements add a significant burden on inspection authorities. However, the sampling frequency can be reduced by not more than half, using remote sensing technologies or quick scan analysing methods to verify a possible non-compliance. Therefore, the use of Remotely Piloted Aircraft Systems (RPAS) has become an important support of the PSC authorities for better managing the mandated increased the frequency of the monitoring of ship emissions (EMSA 2018b). In this context, EMSA offers RPAS services for the individual EU Member States' surveillance of SO_x emissions from ships. Thereby, EMSA supports the Member States' PSC in their effort to monitor and inspect the compliance of ships with sulphur limits in SECAs/ECAs and all other EU waters (EMSA 2022b).

3. EMSA's RPAS services

Under EMSA's marine multi-purpose surveillance, RPAS can be used as a complementary tool in the overall surveillance chain. This helps to increase maritime situational awareness for Member States and allows the PSCs to reduce the sampling frequency by half, using remote sensing technologies like RPAS or quick scan analysing methods to verify a possible non-compliance.

EMSA's RPAS service provides long endurance and long-range drones used in the civil maritime surveillance domain to support the execution of coast guard functions and to monitor pollution or control compliance with the sulphur limits (EMSA 2017a). EMSA's Marine Pollution monitoring and detection service uses RPAS, which have the enhanced capability to detect and analyse not only an oil spill at any time of the day and can stay on site during response operations. Since RPAS are multi-purpose in nature and can be used for a range of activities of marine surveillance, they can also be used in the surveillance of compliance with sulphur limits. Advantages of using RPAS include large coverage, long endurance of sea areas surrounding EU or EFTA countries or even EU adjacent sea basins, for extended periods (EMSA 2017a). Depending on RPAS type, flights can begin very quickly once the operation has started, and flight data can be complemented with other maritime data available to EMSA. RPAS capabilities include to stay on site to support local operation for vessels, the monitoring and detection of marine pollution including oil spills and litter, as well as the general identification and tracking of vessels of all

sizes and their activities including identifying potentially illegal activities (EMSA 2017a, 2018a). Regarding marine pollution monitoring and detection, such pollution can be reduced by the prompt response of Member State authorities and by the setting up of effective deterrents.

The combination of Near-Real-Time delivery of satellite radar images to a Member State authority with subsequent RPAS overflight can provide operational information like confirmation of an oil spill or non-compliance with sulphur limits and is a cost-effective solution to efficient marine monitoring (EMSA 2018a).

4. EMSA's ship emissions monitoring and the utilisation of RPAS in marine sulphur emission surveillance in the EU

Based on the introduction of the IMO's new global sulphur limit and its transposition into EU law in Directive (EU) 2016/802, the Commission Implementing Decision (EU) 2015/253 requests the EU Member States authorities to carry out more controls and sampling regarding the compliance with the sulphur limits of 0.1% in ECAs/SECAS and 0.5% at global level.

The verification of compliance should be carried out either through obtaining and analysing a fuel spot sample from the ship's fuel service system, or by analysing the relevant sealed bunker samples on board. This is applied at least in 40% of cases out of the mentioned minimum 10% of ships in EU Member States fully bordering Sulphur Emission Control Areas (SECAs), 30% in Member States partly bordering SECAs and 20% in Member States not bordering SECAs (Decision (EU) 2015/253).

RPAS offer a wide range of possible benefits and utilisation purposes, also including the monitoring of shipping traffic and sensing of sulphur levels in the smoke of ships for the compliance with the ECAs/SECAs and the global sulphur limit (EMSA 2022b). Monitoring the ship emissions by using RPAS can help to enforce the Directive as the information provided can be shared among the relevant authorities. Regarding the SO_x emission control within and outside ECAs/SECAs, RPAS can be used as aerial platforms with gas sensors ("sniffers") to make measurements of the amount of SO_x versus the CO_2 in a ship's emission plume.

This relationship can ascertain the amount of sulphur content in the fuel being used on board. Based on these measurements, the sulphur content of the ship's fuel can be estimated and compared to the legal limits. The RPAS also carry sensors to assist in the identification of the vessel. This operational information can be complementary to the emission monitoring activities of Member State authorities to ensure that all vessels in transit in European waters comply with the legal requirements. (EMSA 2017).

Since the EMSA is closely involved in the air pollution work within the EU, its RPAS drones also assist in maritime surveillance operations and ship emission monitoring. RPAS allow remote sensing of sulphur levels in the smoke of ships and the EMSA service provides RPAS capable of measuring the amount of SO_x emitted by individual vessels travelling in and outside the European ECAs. The utilisation of RPAS allows the authorities to reduce the frequency of physical sampling by the maximum of half, using remote sensing technologies or quick scan analysing methods to verify a possible non-compliance for inspecting the ships' compliance with the sulphur limits inside and outside ECAs/SECAs.

The RPAS sensor payload includes gas sensors for the SO_x and CO_2 associated calibration, electro-optical cameras to record the maritime scene, e.g., photographic evidence linking the plume to vessel and/or general observing of vessel activities, thermal infrared cameras for plume shape identification, vessel identification, the general observation of vessel activities during the day or at night, and AIS transponder to identify vessels and determine their position,

among others (EMSA 2017b). RPAS flights can take place in a broad range of conditions, i.e., variable environmental temperature, high humidity and (as there is no human pilot onboard) potentially dangerous environments, like flying in a plume (EMSA 2017b). RPAS monitoring of SO_x emissions can thereby significantly reduce the additional burden of monitoring and sampling for the authorities, as required under the Commission's implementing Decision (EU) 2015/253. The combination of real time on-site data from an RPAS together with the maritime information available through EMSA, and the availability of Member State sulphur inspectors can be considered a cost-effective solution for emissions monitoring as well as a possible deterrent (EMSA 2017b). Flight data can be enhanced with other maritime data available to EMSA and integrated in EMSA systems.

The THETIS-S data system collects data on sulphur emissions and all information is transmitted to the THETIS-EU database where alerts and outcome of the Port State Control inspections are recorded (EMSA 2018b). This supports the EU Member States in their enforcement of the Sulphur Directive (Directive 2012/33/EU) and the Directive (EU) 2016/802, respectively.

Starting from 2020 the RPAS operations have been concentrated on maritime geographical areas with common operational interest for more than one Member State or EU agencies (EMSA 2022a). The RPAS services offered by EMSA are part of EMSA's regional RPAS strategy, which allows multiple coast guard functions in several EU Member States (EMSA 2021). The EU Member States use EMSA's RPAS free of charge, for the surveillance of compliance with regulations on the SOx emission limits within ECAs. RPAS can also be used in non-ECAS areas for measuring the sulphur content in the plume of a vessel. The RPAS have been in operation since 12 July 2021 from a base in Tarifa, Spain and continued until the end of October 2021. This marked the first time the SO_x emissions have been monitored by drones outside the Northern European SECAs (EMSA 2021). The operation was carried out by the Spanish General Directorate of Merchant Marine under the direction of the Spanish Ministry of Transport, Mobility and Urban Agenda (MITMA). In this case, by using EMSA's RPAS service, the goal was to detect cases of non-compliancy with the IMO's International Convention on Maritime Pollution (MARPOL – Annex VI) general limit of SO_x emissions of above the allowed 0.5% of SO_x in the fuels used by a vessels in general, outside ECAs/SEACs.

While this monitoring and control of the ship emissions does not directly confirm non-compliance, it does help the port authorities to easier screen the vessels in busy marine areas like the Strait of Gibraltar and to specifically target certain ships for a possible closer inspection to verify a suspected non-compliance and to proceed with the lab testing of the fuel (EMSA 2021).

5. EMSA awards new contracts for satellite communication services to secure next generation RPAS surveillance operations

The portfolio of RPAS services is continually being adapted by EMSA to reflect the newest technologies, while focusing on the most useful technologies for EU Member State users (EMSA 2022d). EMSA's European Coast Guard Functions Forum Workshop participants highlighted that the "real time exchange of information with shore" is one of the key strengths of using RPAS for maritime surveillance (EMSA 2022d).

Therefore, to further support the maritime RPAS surveillance operations, EMSA has recently awarded six contracts for satellite communication (satcom) services. These new satcom services are intended to guarantee accessible, secure, and autonomous satellite communication services for the current but also for the next generation of RPAS services (EMSA 2022c). The contracts are intended to provide fast and effective

communications both to the EMSA's RPAS service providers as well as indirectly to the maritime authorities using the RPAS services (EMSA 2022c). EMSA's contracts cover three different service categories, including satellite services for beyond radio-line-of-sight communications, satellite connectivity services for land-to-land communications, and satellite services for ship-based RPAS operations (EMSA 2022c).

Framework contracts for RPAS beyond radio-line-of-sight communications have been signed with SES Techcom for two different services to provide high performance wideband satellite capacity for high data rate applications. This includes in particular the transmission of simultaneous sensor streams, the delivery of high-resolution images/videos, and a command-and-control link from the RPAS to shore (EMSA 2022c). Furthermore, EMSA has also signed framework contracts for satellite connectivity services for land-to-land communication services with Viasat Netherlands, Telespazio France and SES Techcom as well as framework contracts for satellite connectivity services for ship-based operations with SES Techcom and Telespazio France (EMSA 2022c). The contracted services will encompass the service set-up, equipment leasing and related maintenance, as well as all the necessary space and ground segment infrastructure (EMSA 2022c).

With these new capabilities, EMSA will have access to a large pool of satellites to guarantee accessible, secure, and autonomous satellite communication services not just for this generation of RPAS services but also for the next (EMSA 2022c).

6. Conclusion

The RPAS services provided by EMSA allow the monitoring of sulphur levels in the ship emissions' plume, as the RPAS sensor payload includes gas sensors for the SO_x and CO_2 emissions associated calibration, electro-optical cameras to record the maritime scene, e.g. photographic evidence linking the plume to vessel and/or general observing of vessel activities, thereby helping to measure the amount of SO_x in a plume emitted by a ship. It is the first step in the process to test the compliance of ships in EU waters with the sulphur limits in SECA and non-SECA areas. Using remote sensing technologies or quick scan analysing methods such as RPAS services has gained in particular more importance as it allows the PSC authorities to reduce the frequency of physical sampling in the testing of compliance with the sulphur limits, based on the implementation decision (Decision (EU) 2015/253). Therefore, it can be expected that EMSA's RPAS services will become more important in the testing of compliance in all EU waters.

To further support the maritime RPAS surveillance operations and to prepare for the next generation of RPAS services, EMSA has recently awarded six contracts for satellite communication (satcom) services to provide fast and effective communications to the RPAS services.

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