AVIATION AND DRONES SESSION MOM

Meeting Date	08.10.2024	**Time**	09:30-17:00
Meeting Called By	EUSPA	**Location**	Online event
Minutes Taken By	Jan Cernan, Egis	**Next Meeting Date**	N/A
Attendees	**Kateřina Peña, EUSPA, Session moderator** **Jakub Karas, EUSPA** **Fernando Argueso, EUSPA** **Arnis Kadakovskis, EUSPA** **Philip Church, Egis, Panel coordinator** **Jan Cernan, Egis** **User Community Representatives (UCRs)** Natale Di Rubbo, EASA Antoine Henry, Innov'ATM Jiří Pavlík, STRATOSYST Alfredo Serrano, Sceye Pablo Haro, EUROCONTROL Pawel Korzec, Droneradar Georgios Synnefakis, EMSA Magdalena Mendijur, EMSA Roberto Gándara Ossel, AESA Vladimír Foltín, EASA Lukáš Brchl, Dronetag Alberto Mennella, TopView Emmanuel Davidson, AOPA France Urban Mäder, FLARM Jeremy Bennington, Spirent Ettore Canestri, EUSPA Fabien Frossard, EUSPA Koen Meilink, S&T Adrián Sánchez, ESSP Laurence Hawker, Fathom		
Distribution (in addition to attendees)	UCP Plenary, EUSPA, Public		

Agenda Items	Presenter
1. Welcome and introduction to EU Space Programme	Kateřina Peña, EUSPA
2. Update on the status and progress (drones)	Jakub Karas (EUSPA)
3. Copernicus to support SORA	Jakub Karas (EUSPA) Natale Di Rubbo (EASA) Antoine Henry (Innov'ATM) Arnis Kadakovskis (EUSPA)
4. User requirements from new airspace users: HAPS	Jiří Pavlík (STRATOSYST) Alfredo Serrano (Sceye)
5. Navigation (PNT) requirements for drones	Pablo Haro (EUROCONTROL) Pawel Korzec (Droneradar)

6. Secure SATCOM for UAS	Georgios Synnefakis (EMSA) Magdalena Mendijur (EMSA) Roberto Gándara Ossel (AESA)
7. Conclusions and closing remarks (drones)	Jakub Karas (EUSPA)
8. Update on the status and progress (manned aviation)	Fernando Argueso (EUSPA)
9. iConspicuity	Vladimír Foltín (EASA) Lukáš Brchl (Dronetag) Alberto Mennella (TopView) Emmanuel Davidson (AOPA France) Urban Mäder (FLARM)
10.RFI – Jamming & Spoofing	Ettore Canestri (EUSPA) Fabien Frossard (EUSPA) José Luis Madrid (ENAIRE) Jeremy Bennington (Spirent)
11. Air quality around airports	Arnis Kadakovskis (EUSPA) Koen Meilink (S&T)
12. Copernicus for procedure design	Adrián Sánchez (ESSP) Laurence Hawker, Fathom Fernando Argueso (EUSPA)
13. Conclusions and closing remarks (manned aviation)	Fernando Argueso (EUSPA)

Summary

This year's UCP was split into two sessions – the morning session featured drone-related topics while the afternoon session focused on manned aviation. The needs and requirements of drone stakeholders were collected across various topics, including regulatory compliance, new airspace users, PNT requirements and finally secure SATCOM. The current challenges that manned aviation faces included RFI interference, environmental topics and means of EO supporting environmental monitoring and procedure design.

The drones' sessions centred around the data needs to support the Specific Operational Risk Assessment (SORA) ground risk assessment. EASA and industry experts highlighted how the updated SORA 2.5 would improve ground risk assessments by making use of population data provided by Copernicus. The participants underscored the need for **population datasets** with **more frequent revisits** and **improved spatial resolution** to meet the growing demands of drone operators. Drone operators noted that having the data on **sheltered vs. non-sheltered** population exposed to drone operations could support the safety case. The HAPS operators highlighted the need for **precise navigation** and accurate EO data supporting HAPS operators to **monitor environmental** conditions and **weather** patterns. The satellite imagery can also be used to identify suitable **landing spots** for HAPS. The Navigation PNT session emphasised the importance of **Galileo differentiators** (HAS, OSNMA) and presented the challenges of precise navigation in **non-open sky** environments suggesting **hybridisation of sensors** could be a feasible solution for such operations. The challenges of secure SATCOM for drones are linked to **bandwidth, latency, availability, the type of the link and coverage**. The key user requirements are linked to **symmetry of the link, distribution, setup, speed** and **security protection**.

The manned aviation session started with a discussion on iConspicuity since the topic concerns both manned and unmanned users. The **availability** (50%) and **integrity** (43%) were noted as key

performance parameters for iConspicuity solutions. The poll has revealed that the **altitude reference** system used might be **point to address** when it comes to integrating manned aviation and drones within the same airspace. The **cost of** OSNMA and multi-constellation capable EGNSS **receivers** was noted as a potential barrier for greater uptake. The discussion on RFI interference showed several users **experienced jamming** or **spoofing** when flying. The potential mitigations, as seen by the users, include DFMC receivers, OSNMA, SBAS authentication and CRPA (Control Reception Pattern Antennas) – ordered by preference. To improve the environmental assessment around airports, users requested finer **spatial** and **temporal accuracy** of relevant EO datasets. The current Copernicus datasets (DEM GLO-30) **satisfy Area1** and partially **Area2** requirements for procedure design.

1 MINUTES OF MEETING

NOTE: A short survey was presented at the end of each topic. Participants had an opportunity to use their mobile phones to connect to Slido and complete the surveys. The results were shown after each survey. It is important to note that the results might not be considered as validation of user needs due to limited number of respondents, but rather as collection of additional inputs from users. The minutes includes references to some results.

Welcome and introduction to the UCP / DG DEFIS & EUSPA

Ms. Jolanda van Eijndthoven, DG DEFIS, welcomed the participants and highlighted the dedication of the European Commission to support EUSPA in developing user-centric systems. Ms. Fiammetta Diani, EUSPA appreciated her words, emphasised the need of users' feedback and explained the organisation of today's UCP sessions.

Mr. Giovanni Lucchi, EUSPA, presented an overview of all UCP sessions and noted the objective to collect user needs and requirements throughout the sessions. He highlighted existing surveys that EUSPA was running to collect user requirements and invited all to respond.

AVIATION & DRONES MORNING SESSION (DRONES)

09:15 – 09:30 Introduction, Kateřina Peña (EUSPA)

Mr. Philip Church, Egis, welcomed everybody and introduced the housekeeping rules. Ms. Kateřina Peña, EUSPA, provided an overview of the EU Space Programme 2021-2027. She highlighted the key components of the programme, including EGNOS, Galileo, Copernicus, GOVSATCOM, IRIS^2 and SSA.

09:30 - 09:45 Update on the status and progress on GNSS and EO requirements for drones, Jakub Karas (EUSPA)

Mr. Jakub Karas, EUSPA, provided an overview of the activities undertaken by EUSPA to address drone user needs and requirements collected in 2022. He highlighted several key projects, including SAMVA, DEGREE, Certiflight and the key activities undertaken and ongoing within Eurocae WG-105 UAS. Then, he proceeded to describe how OSNMA and HAS can support drone operations. To finalise his presentation, a short video demonstrating how EUSPA practically supports drone operators using GNSS and EGNOS with new EGNSS Training for drones was showcased.

09:45 – 10:30 Copernicus to support SORA, Jakub Karas (EUSPA)

Mr. Karas introduced SORA as a 10-step risk assessment process. The current version (2.0) will soon be updated to SORA 2.5. The key changes are linked to ground risk assessment (iGRC) as it moves from a qualitative to quantitative assessment, considering population density. Mr. Karas pointed to Annex F chapter 3.6 where the details can be found and proceeded to highlight the EUSPA – JARUS formal partnership established in May 2024. Mr. Karas then underlined the need for efficient cooperation which is done within the EASA's IAM (Innovative Air Mobility) HUB and EASA Working Groups for Population Density data static/dynamic. Guidelines for developing SORA are being developed within EASA WG led by EUSPA and will include the use of Copernicus datasets. To close his presentation, he presented the innovative project run by EUSPA looking into using Copernicus Global Human Settlement Layer (GHSL) data for SORA. EUSPA cooperates with Innov'ATM and Instadrone in France and HELICUS in Belgium and will run BVLOS demonstration flights towards Q4 2024.

09:45 – 10:30 Copernicus to support SORA, Natale Di Rubbo (EASA)

Mr. Natale Di Rubbo, EASA, expressed gratitude for the opportunity to contribute as well as appreciation for the cooperation between EASA and EUSPA. The EASA drone regulation has been in place for a few years already and Mr. Di Rubbo explained how drone operators identify the ground risk and where SORA 2.5 provides improvements which will become applicable at the beginning of 2025. Additionally, it was noted that EASA is already working on future revisions focusing on air risk.

He explained that the IAM HUB aims to support both drone operators, authorities and municipalities assessing the feasibility of introducing urban air mobility with consideration to ground risk. A prototype map has been created using GHSL data. Mr. Di Rubbo explained the issue of using static population data which is tied to home addresses. The reality can however be different – e.g. beaches in summer can be crowded. EASA is currently starting from the first layer i.e. to identify critical areas using GHSL data and looking into creating different layers for various parts of the day or seasons. The ultimate objective is to have a single system supporting all European operators.

09:45 – 10:30 Copernicus to support SORA, Antoine Henry (Innov'ATM)

Mr. Antoine Henry, Innov'ATM, explained that Innov'ATM is a U-space service provider (USSP) and briefly introduced U-space including how drone operators have to assess the operational risk as part of the SORA process. Innov'ATM has a dedicated software called DroneKeeper to support operators in France when planning their missions including an integrated risk assessment tool that drone operators can use. Mr. Henry presented two Copernicus datasets (Urban Atlas and GHS POP) that Innov'ATM is testing within an EUSPA's project and highlighted the key shortcomings of the datasets.

The GHS-POP data is provided in a square grid. If operators could use population data tailored to specific polygons (operational area), the SORA would become more seamless. Mr. Henry underlined the need for dynamic population density data, however appreciated the complexity and sees this as a future improvement. A practical demonstration of the DroneKeeper tool was showcased at the end of the presentation.

Copernicus to support SORA, User needs and requirements discussion

To summarise the discussion, the session addressed key challenges and shortcomings for utilising Earth Observation for drone operations. Mr Karas presented on the recent and future changes to SORA methodology followed by EASA's presentation on new elements introduced by SORA 2.5. The key challenges are linked to presenting a realistic ground risk assessment. The use of dynamic population data is considered as ideal but at this early stage the development is focused on static data provided by Copernicus. Innov'ATM presented their initiatives in integrating such data into their flight planning software and highlighted the data shortcomings. These are mainly linked to absent "sheltering" factor,

update rates and precision for Urban Atlas dataset. For GHS-POP, Innov'ATM would appreciate polygons with shapes consistent with residential areas, further statistics available (e.g. mean, max), higher update rates and data on population variability throughout the day.

Mr. Arnis Kadakovskis, EUSPA**,** reiterated the data needs for iGRC [1] and highlighted gaps in understanding the user requirements. Mr. Kadakovskis further explained temporal profiles of population density varying depending on the time of the day. He clarified that the industry needs good accuracy at reasonable cost and presented the "Day/Night change of density" map. He listed the key parameters relevant to SORA, including accuracy, spatial/temporal resolution, coverage, availability and continuity. He closed his presentation by proposing to add "predictable variability to static maps" to consider the seasonality.

Mr. Di Rubbo explained the size of the population density grid (200x200m) and stated that he does not believe the shape of the tiles as mentioned by Mr. Henry is critical for the assessment. The data from Copernicus will be available on EASA's website for free while for more critical missions, real time data will be needed.

Mr. Di Rubbo responded to a question from participants whether highways and roads were also considered when doing the risk assessment. He highlighted ongoing initiatives in developing maps covering all roads, railways, rivers and vessels. This helps developing guidelines that provide the methods in risk assessments when overflying these infrastructures. Guidelines were published last week on how to fly BVLOS. For the specific category, discussions are ongoing in the WG within EASA to consider whether flying perpendicularly across these obstacles (short crossing time) requires evaluating the density of traffic. EASA cannot provide a definite answer at this moment, so for now it will continue to be assessed on case by case scenario by the National Aviation Authority (NAA).

Mr. Karas then underlined the need for efficient cooperation which is done within the EASA's IAM (Innovative Air Mobility) HUB.

Mr. Henry highlighted the following shortcoming of the EO datasets currently used by Innov'ATM:

- The Urban Atlas provides a resolution of 10m, which although generally useful, might not be sufficient for some use cases.
- Urban Atlas' coverage could be improved as only cities >50K inhabitants are covered. It would be better to have the entire country/continental Europe covered by the Urban Atlas dataset[2].
- Percentage of people protected by a roof, which affects the number of people injured if a drone crashes. If people are protected by roof, then they will not be injured, which is relevant information when conducting a risk assessment.
- The update rates are insufficient. Yearly updating would be more acceptable.
- A need for quantitative accuracy assessment of the population density data so that end users could adjust safety margins.

The survey revealed that most users (83%) use open street maps to complement population data. Less frequent tools include freely available satellite/aerial imagery (63%) and land use/land cover maps, cadastres and site surveys (all 38%). The survey was completed by 16 participants.

[1] SORA intrinsic ground risk class
[2] Note: Corine Land Cover provides same type of data but with lower granularity.

SESSION BREAK

10:45 – 11:15 User requirements from new airspace users: HAPS, Jiří Pavlík (STRATOSYST)

Mr. Church introduced High Altitude Platform System (HAPS) and introduced Mr. Jiří Pavlík from STRATOSYST. Mr. Pavlik explained that drone operators need to be aware of operational constraints such as building heights as well as battery limitations. Such issues are addressed with HAPS which is a much faster and efficient solution combining the capabilities of satellites and drones. HAPS can be used in different sectors, but it was noted that EO data provision is the easiest to implement. Mr. Pavlik continued to illustrate the benefits of HAPS by explaining that, depending on the payload, it can transmit GNSS differential corrections to other users, significantly improving their accuracy performance. He concluded that precise navigation is crucial, and this technology can extend current applications and services in Europe. Planned upcoming sessions with EGNOS will further validate the benefits of this technology.

10:45 – 11:15 User requirements from new airspace users: HAPS, Alfredo Serrano (Sceye)

Mr. Alfredo Serrano, Sceye, began by stating that there are currently not many HAPS companies and proceeded to introduce a specific service: the interoperability of HAPS with LEOs. Mr. Serrano reiterated the benefits of HAPS that Mr. Pavlik previously touched upon before moving on to potential collaborations with HAPS such as GNSS and EO services. Exploring synergies between HAPS and LEO constellations will lead to improved services and wider accessibility. This will help satellites-based services, due to their proximity to the Earth's surface, by providing higher resolution, lower latency, higher speed. HAPS can fill the gap for many applications that require persistency. Furthermore, HAPS can provide service redundancy and reliability to LEO satellites.

Additionally, being closer to the ground, HAPS will be able to identify GNSS spoofing and jamming. For HAPS as a GNSS user, positioning and navigation are critical to maintain the intended flight path and altitude, especially when managing an autonomous fleet of HAPS. When considering timing and synchronisation, GNSS can provide precise timing information, not only to synchronise HAPS flights and fleet, but also the payload. In addition, HAPS can serve as communication relay for GNSS signal, provide GNSS coverage to areas where signals may be obstructed and support the operations of UAS flights. HAPS are capable of GNSS augmentation, tropospheric error detection and correction and reducing multipath and fading effects.

Mr. Serrano presented the benefits of collaboration with EO services such as data complementing for satellite imagery purposes. Other collaboration benefits are presented under the umbrella of scientific research, disaster management and surveillance. The latter is an ongoing project with missions starting no later than 2026. Mr. Serrano finished by highlighting the additional benefits to first responders with HAPS being used for relief purposes.

The satellite imagery and remote sensing data from EO satellites can be used to calibrate, validate, or complement the data that is captured by HAPS. This integration process can be done by cross reference data collected by HAPS and LEO satellites. The LEO satellites can provide information on environmental conditions and weather patterns, but the main use is to help plan HAPS missions and assess risks and make real-time operation decisions. For example, satellite imagery is used to determine and identify suitable landing spots for HAPS.

Sceye currently works with Spanish space and defence company and a university on atmospheric research. HAPS and satellite data can provide an advantage in stratospheric study by complementing satellite data with in-situ measurements e.g. ozone concentration, UV, emissions levels, water vapour which validate atmospheric models in weather forecast and anticipate severe climate events.

Mr. Serrano sees HAPS as another layer supporting LEO satellites in identifying the effect of major disasters. Not only for assessment purposes but also to support first aiders.

HAPS, User needs and requirements discussion

To summarise the HAPS session, STRATOSYST highlighted the HAPS capabilities in capturing EO data and emphasised the importance of precise navigation facilitated by GNSS. Sceye further elaborated on the capabilities of HAPS and noted the benefits of EO data for HAPS mission mainly to calibrate, validate, or complement the data that is captured by HAPS. Presentations concluded with a need for more flexible regulatory landscape allowing HAPS manufacturers and operators to develop and test their prototypes more efficiently, while maintaining high safety levels.

Mr. Church thanked the speakers and presented a table with EO user needs and requirements. The speakers were asked whether they agree with the initial requirements and data presented (table below).

Operational scenario	Scale	Frequency of information	Spatial resolution	Temporal resolution	Data type / spectral range
Weather Monitoring	From local to worldwide	Hourly to daily	<1km high-resolution models and some satellite products tens or hundreds of kilometres for global models and longer-range forecasts	hourly to daily	Precipitation data, temperature data, multispectral imagery, atmospheric chemistry data, microwave radiometry, Synthetic Aperture Radar (SAR), wind data.
Safety Risk Assessment (Population Data)	Local	Monthly	200m	Year	Density of population; Land cover
Trajectory Analysis	From local to worldwide	Hourly to daily	Ad-hoc but 10m is acceptable	Not applicable	Wind data: Information on wind speed and direction at stratospheric altitudes (18-22 km)
Anticipation of Extreme Weather Events	From local to worldwide	Hourly	Ad-hoc depending on the type of event	Ad-hoc	Precipitation data, temperature data, multispectral imagery, atmospheric chemistry data, microwave radiometry, Synthetic Aperture Radar (SAR), wind data.

Mr. Serrano agrees with this initial set of resolutions, but as they experiment more in the stratosphere, further refinement will be required to reflect it more accurately. Nonetheless, there is some trajectory information missing and Mr. Serrano would like to get another set of data from satellites to back their own forecasting. Mr. Pavlik agreed with Mr. Serrano and explained that they also have their own data but would find additional trajectory predictions useful. Answering a question from Mr. Church about operating above 40 degrees of latitude, Mr. Pavlik reassured him that it is not a problem for them to operate higher than 40 degrees as they can cover most areas globally. Similarly, Mr. Serrano added that although operating between 30 and 40 degrees is not a problem, the question is how much power is needed to harness the operation of specific missions and should always be carefully considered.

Mr. Church opened the floor for questions. Ms. Marta Krywanis, Frontex, expressed her impression that HAPS operations still faced some obstacles in Europe. She also briefly noted that they are more advanced in the USA and asked when regulatory framework will be set in place to allow the HAPS operations. Mr. Serrano conveyed that they take pride in their regulations and rephrased the question to inquire why Airbus chose to fly from Arizona rather than Europe. He suggested that a key consideration in addressing this question is the relatively passive approach of European agencies.

The survey showed that the main operational scenarios as mentioned by the HAPS system developers and operators would need population density assessment and support to disaster recovery. Users noted that they might be interested in HAPS providing data on atmospheric conditions, weather, contrails

monitoring and real-time monitoring. The users currently see a number of barriers to use EO data in support of HAPS missions. Namely update rates (50%) and overall data quality (33%). Update rates were also raised as a significant shortcoming by half of the respondents. The majority of the respondents (60%) indicated that they would require at least weekly update rates and the remaining 40% require daily updates to carry out a safety risk assessment to support HAPS operations.

The majority of users aiming to use EO data for weather monitoring require spatial resolution of "few meters" (60%). For 20% of respondents, <1 km is sufficient while another 20% require less than "few meters" accuracy. None of the stakeholders finds spatial resolution of >1 km useful.

The required temporal resolution of EO data supporting anticipation of extreme weather events if hourly (60%) or daily (40%). Lower temporal resolution was not identified as useful. The survey was completed by 6 participants.

11:15 – 12:00 Navigation (PNT) requirements for drones, *Pablo Haro (EUROCONTROL)*

Mr. Church introduced the next session on Navigation PNT for drones. Mr. Pablo Haro, EUROCONTROL, presented the GNSS questionnaire prepared by EUSPA and clarified that his presentation would focus on requirements for positioning accuracy, integrity and GNSS resilience. Mr. Haro explained the position-keeping capabilities (PDE, FTE, NSE and TSE) and emphasised that drone operators should have all errors under control as all of them contribute to the total system error (TSE). The mask angle has an impact on the GNSS accuracy, especially for landing phase in non-open sky conditions (high mask angle), this might be technologically challenging to achieve. Some drone operators use RTK to achieve such a high accuracy – this is where Galileo HAS could contribute. Mr. Haro noted that currently operators use a set of sensors to compensate for GNSS accuracy and presented positioning integrity requirements for SAIL III and SAIL IV operations. Generally, the position source onboard drones is multi-sensor, based on multi-frequency multi-constellation GNSS with augmentations and/or other sensors.

There are certain real-time monitoring functions onboard drones, such as minimum number of satellites in view or geometric configurations of the satellites. Then, certain thresholds can be established, and an alert will be triggered, before contingency actions are taken. Another mechanism for the onboard position monitoring and alerting is based on protection level comparison with the alert limit. The estimated position is known real-time, while the true position is unknown real-time. However, the system can generate the volume of upper confidence bounds in real-time. The type of mission determines the maximum size of positioning error before alerting (alert limit). There is a need for generating protection level tailored to drone missions which is different with respect to what we have for manned aviation. The characterisation of operational environment before being able to generate protection levels is a work in progress.

Jamming and spoofing are significant concerns for both drones and civil aviation as well. Mr. Haro outlined the importance of Galileo OSNMA which would further be touched upon by Mr. Korzec. Mr. Haro announced tentative and technology agnostic PNT needs for drone operations which would be discussed at the end of the session.

11:15 – 12:00 GNSS addiction. Is it serious?, *Pawel Korzec (Droneradar)*

Mr. Pawel Korzec, DroneRadar, introduced himself and the title of his presentation, 'GNSS addiction', posing the question of whether this phenomenon is a serious issue. According to Mr. Korzec, it is indeed a serious concern, and proceeded to clarify that his presentation would mainly reflect the practical perspective of the subject. Nowadays, conducting spoofing has become very easy due to the

wealth of readily available information on the internet which provides detailed instructions to any student and low price of such devices. This accessibility makes it a significant concern.

Mr. Korzec briefly presented the effects of spoofing on manned aviation, unmanned aviation and its impact on time. The latter can be manipulated, thus opening up a range of opportunities, introducing an element of unpredictability. Mr. Korzec presented a use case on drone shows and continued to show a spoofing example to highlight the risks. Jamming and spoofing can be local but can also extend to much larger areas – this is made clear with an illustration presented on the slide. Use case 2 discussed airport monitoring/protection and Mr. Korzec further justified the risks by using a practical example. As jamming and spoofing can occur anywhere at any time, Mr. Korzec noted the importance of asking the question of who should be responsible for monitoring the area and encouraged individuals to consider the potential effects of GNSS anomalies for SORA. Mr. Korzec continued by providing advice in response to spoofing, clarifying that one should not panic and should write a report to inform the pertinent authority after such event. A jammer test was showcased where the jamming/spoofing attack can be recorded, and Mr. Korzec concluded with a brief summary.

Navigation PNT, User needs and requirements discussion

In this session, Mr. Haro presented the results of the GNSS survey developed by EUSPA. The user requirements were in line with the initial stakeholder consultation done as part of the UCP. Specific attention was paid to non-open sky performance which represented operations in build-up areas. The results show that achieving the required performance by utilising GNSS only is technologically challenging and thus hybridisation of sensors and/or appropriate procedures will play a key role. Mr. Korzec touched upon the reliance of GNSS and its vulnerabilities. He introduced number of proposals when dealing with RFI interference, including following the checklists, equipping GNSS receivers with anti-jamming and anti-spoofing capabilities (e.g. OSNMA) and report to authorities.

Mr. David Comby, DGAC commented on the target level of safety and alert limits. He raised two questions. His first question was about the way in determining the alert limit. It is unclear whether it is up to the operator or linked to safety requirements. His second question was about OSNMA to counter spoofing. He acknowledged that it is a way to decrease risk of spoofing, but OSNMA is just for Galileo services. What are the tools that are used to make confident in it being efficient against spoofing?

Mr. Haro explained how TTA (time-to-alert) and alert limits work. The width of the corridors is tailored to the operations and referred back to an equation that he presented earlier. The alert limit depends on the width (or height) of the corridor and the flight technical error. The OSNMA for Galileo is being discussed which may detect some types of spoofing attacks. Having two parallel PVT solutions (MFMC and authenticated Galileo-only) could be useful. Drones mostly operate in an autopilot mode based on multi-frequency multi-constellation (MFMC) and may also have in parallel an authenticated Galileo-only PVT based on OSNMA. Depending on the mission and based on computer-derived threshold, an alert will be raised when these two positions: MFMC and authenticated Galileo-only deviate beyond certain threshold.

The survey revealed that most of the users (67%) operate in open sky (<10 deg mask angle) locations for landings while only 16.5% of users typically land in non-open sky conditions (20-30 deg mask angle) and 16.5% in very high mask angle conditions (≥ 40 deg).

The required horizontal positioning error HSNE(95%) is between 2 and 5 meters for en-route flight and <1 meter for landing. The required vertical positioning error VSNE(95%) is between 2 and 5 meters for en-route flight and <1 meter for landing. The majority of users (38%) require <20 cm vertical accuracy

for landing. The current capabilities of GNSS in combination with stringent user requirements for landing phase are underlined by the fact that only 26% of respondents rely purely on GNSS or augmented GNSS. The rest uses GNSS in combination with other sensors or completely different means for position determination.

According to the survey, none of the operators currently use Galileo HAS, but the majority of them (75%) are interested in sub-meter accuracy without using RTK. The GNSS receivers may be a barrier to greater HAS uptake as 25% of respondents note that their receivers are not HAS-capable. Majority of respondents use tools to monitor performance of positioning sensors. The 86% of respondents can tolerate a horizontal positioning error of 3 to 10 meters without issuing an alert. Less tolerance is highlighted for vertical dimensions as 57% or respondents accept <5 meter error without receiving an alert.

The majority of respondents (63%) have experienced RFI interference and have implemented or are planning to implement measures to mitigate the effects, OSNMA being a potential solution for spoofing.

In general, users can accept a failure rate without an alert of 1 per 1,000 (10^{-3}) or 10,000 (10^{-4}) flight hours while 26% of respondents can accept lower reliability (<100 hours, so >10^{-2} per flight hour). The survey was completed by 8 participants.

12:00 – 12:30 Secure SATCOM for UAS, *Georgios Synnefakis (EMSA)*

Mr. Georgios Synnefakis, EMSA, presented on GOVSATCOM for manned aviation and BVLOS drone flights. Mr. Synnefakis introduced the current status of the communication environment (currently fragmented). The GOVSATCOM will bring a unification, resilience and cost efficiency to governmental operations. Mr. Synnefakis presented the GOVSATCOM HUB ecosystem which maintains the pool of all resources. The HUB ecosystem will provide capacity in unexpected occasions. Mr. Synnefakis showcased the chart of GOVSATCOM's infrastructure which features automation, anonymisation of the user, service portfolio, security monitoring and many other elements. Certain levels of SATCOM services will be provided for free with tokens provided by the European Commission. Once a specific number of tokens is used, members will have to "top up" their accounts. The full operational capability (IS – initial service) is expected in 2027. The IRIS^2 services (LEO/MEO) will also be provided through GOVSATCOM services.

12:00 – 12:30 Secure SATCOM for UAS, *Magdalena Mendijur (EMSA)*

Mr. Church briefly outlined the SATCOM market and pointed to a link on the slide for more information. Ms. Magdalena Mendijur, EMSA, then introduced Secure SATCOM for UAS. Ms. Mendijur defined EMSA (European Maritime Safety Agency) and outlined the various services they offer. The focus of the presentation was primarily on the RPAS services provided to EU member states and agencies with a brief illustration of EMSA's extensive portfolio. A link was provided for more information on the latter. To provide context, Ms. Mendijur noted that in 2024, EMSA conducted 9 simultaneous operations across different locations. She then presented a use case that addressed flights beyond the range of traditional communication systems, illustrating two data links: command and control, and payload data link.

Two additional use cases were presented. Use case 2 demonstrated the use of satellite internet for ship-based operations in areas lacking conventional internet access. Similarly, use case 3 highlighted the same satellite internet service but applied to land operations. Ms. Mendijur listed the various fields of application for these services, emphasizing the importance of achieving global coverage. She

also highlighted critical aspects for SATCOM systems, including the need for high accuracy, a flexible operational framework, and reasonable costs.

12:00 – 12:30 Secure SATCOM for UAS, *Roberto Gándara Ossel (AESA)*

Mr. Roberto Gándara Ossel, AESA, thanked EUSPA for organising the UCP and introduced his presentation on BRLOS (Beyond theoretical Radio Line of Sight) in a specific category. At 20-50km, the radio link can degrade, and the operators need to change the C2 link e.g. to satellite-based. The medium range operations (50-500km) may include linear inspection, environmental survey or security surveillance. For such operations, three links are needed to achieve sufficient reliability of the network. AESA currently issues authorisations for SAIL II operations. On the other hand, for SAIL III operations, require medium robustness of the C2 link. Mr. Ossel noted that providing a C2 link through SATCOM means that the compliance with OSO 6 Communication requirements needs to be ensured. The functional performance requirements are linked to OSO 5 and OSO 24.

Secure SATCOM for UAS, User needs and requirements discussion

Mr. Church highlighted the challenges and needs in relation to Secure SATCOM. These are linked to bandwidth, latency, availability, the type of the link and coverage and were presented. The symmetry of the link, distribution, setup, speed and security protection requirements were highlighted as well. Mr. Church invited users to respond to the survey to collect any additional user requirements. Ms. Peña noted that EUSPA plans to have more interviews with users to collect their feedback.

The survey on user requirements for secure SATCOM has highlighted several key priorities. The most significant requirements include bi-directional data flows and medium latency of less than 500 milliseconds, both emphasized by 71% of respondents.

High availability and high bandwidth of greater than 10MB were important to 57% of users, indicating a strong need for reliable and fast data transmission. Data integrity was unanimously considered crucial (100%), highlighting the importance of maintaining accurate and unaltered data. Additionally, 57% of users required support for user-to-user communication, immediate responsiveness within minutes, and the ability to handle normal movement speeds of over 40 km/h.
Other parameters, such as regional coverage in Europe (43%) and the preference for either bi-directional use or 80/20 for internet use (both 50%), did not meet a representative sample size. Consequently, these requirements are less significant compared to the main priorities identified. The survey was completed by 7 participants.

12:30 – 13:00 Conclusions and closing remarks on drone part, Jakub Karas (EUSPA)

Mr. Karas briefly summarised the discussion and the results of the presentations covering drones during the morning session. With respect to Copernicus, he noted that users expect guidelines to be developed for the use of population density data in specific operational risk assessments. Currently EUSPA is working with EASA to prepare and implement these guidelines. Key inputs are required from the perspective of land use data, as well as predictable, static temporal profiles such as day/night and seasonal variations. Mr. Karas also noted the discussion on the level of safety in higher SAIL and its connection with PNT. Furthermore, using GNSS in non-open sky conditions, and jamming and spoofing topics were highlighted as important to support wider drone applications.

With respect to SATCOM Mr. Karas noted the challenges highlighted by the speakers related to guaranteed access, availability for operations, limitations in radio range, and communication requirements to support BVLOS operations. Issues surrounding geographical coverage were also

discussed. It was noted that SATCOM has a clear link to OSO 13 and 6, and that there remains a need for more input to fully develop user requirements and operational needs as solutions in this space.

Finally for HAPS Mr. Karas noted the challenges of utilising EO data for operational planning, particularly concerning update periods and resolution. There are regulatory framework obstacles that still require collaboration between agencies and improving this will be a major focus for the coming year.

- LUNCH BREAK -

AVIATION & DRONES AFTERNOON SESSION (MANNED AVIATION)

14:00 – 14:15 Update on the status and progress on GNSS and EO requirements for manned aviation, Fernando Argueso (EUSPA)

Mr. Church welcomed everyone back and invited Mr. Fernando Argueso, EUSPA, to introduce the manned aviation session.

Mr. Argueso highlighted the needs in 2022 and what was covered in that UCP. The highlighted needs incorporated enabling dual frequency as it is currently still a challenge and Mr. Argueso noted that resilience and robustness are both still very relevant today. Additionally, the Green Deal strategy presents a concern and development of more environmentally efficient operations is crucial in the near future. Mr. Argueso continued to point out the progress since the last UCP and commented that SBAS authentication is on its way to make the systems more robust. Another concern from the highlighted needs is the need for iConspicuity solutions where Mr. Argueso defined several services being developed for it right now.

Further highlighted needs in 2022 were presented with regards to EO services where assessments and actions taken in the last two years were described. Pilot project fundings were mentioned but Mr. Argueso explained that these would be described further at a later stage. Mr. Argueso further underlined the growth of manned aviation in the last two years. Particular notice was given to the additional growth of interference threats (jamming/spoofing), presenting a major challenge for aviation. On the other hand, the growth in manned and unmanned traffic increases the need for electronic conspicuity supporting situational awareness. Mr. Argueso proceeded to mention examples of assessments and data required to develop solutions and reassured the attendees that this would be covered further this afternoon. Mr. Argueso concluded with a brief overview of the different applications selected for UCP2024 that would be covered at later stages in the session.

14:15 – 15:00 iConspicuity, Vladimír Foltín (EASA)

Mr. Vladimír Foltín, EASA, introduced iConspicuity as a concept that aims to aircraft being connected for better situational awareness – a concept initially developed for manned aircraft. These days, the concept is being expanded to unmanned aircraft as well. Mr. Foltín presented the results of research that had been completed on iConspicuity. He highlighted that both certified and uncertified solutions need to be able to work together (without a human in the loop). A high-level iConspicuity roadmap addressing the key actions for 2025 and 2026 was presented. The focus was placed on three primary use cases – reducing the risk of mid-air collision, enabling EC for U-space and complementing FIS or SAR missions without changing the ATM/ANS principles.

Mr. Foltín noted that the solution in any airspace should be based on “one language and one link” principle. The ADS-B and ADS-L seem to be the best candidates for now for the same language. A direct air-air radio line of sight link is needed under “one link” possibly complemented by additional link for

a larger data transfer not requiring extra low latency communication. Mobile telephony is still planned to be used as a single source of position information in U-space airspace, but this might not work for all airspace and some use cases mentioned earlier. Mr. Foltín presented various technologies that could enable iConspicuity, namely ADS-B Out (1090 MHz), ADS-B UAT (978 MHz), and ADS-L (SRD 860 and Mobile telephony), and noted the advantages and disadvantages for each technology. EASA's approach aims to enhance pilot situational awareness across the EU at all altitudes and improve U-space conspicuity, although it is expected to be initially geographically limited and focused on low altitudes.

14:15 – 15:00 iConspicuity, Lukáš Brchl (Dronetag)

Mr. Lukáš Brchl, Dronetag, began his presentation with an overview of the company. The company's initial products were remote ID transmitters which broadcast the device's position and identification to the surrounding area or transmit this information over a cellular network. Mr. Brchl further explained their commitment to achieving precise positioning, but noted, with the help of illustrations, that their devices are relatively small, which presents challenges in building robustness. Given the increased need for specific operations in urban environments, the company frequently receives questions and concerns regarding the size of their devices. As a result, justifying contingency measures to stakeholders is currently a challenge. Mr. Brchl affirmed the quality of the product and wishes from EUSPA for more available accuracy services (off the shelf products) and enhanced spoofing/jamming mitigation. Mr. Brchl emphasised that if more GNSS chipsets with Galileo differentiators become widely available, Dronetag would be better positioned to develop products tailored for sensitive operations.

14:15 – 15:00 iConspicuity, Alberto Mennella (TopView)

Mr. Alberto Mennella, TopView, introduced himself and presented the Certiflight project on which TopView worked with EUSPA to address EGNSS remote tracking for drones and light aircraft. Mr. Mennella highlighted the need for tracking and legal recording service. Furthermore, Mr. Mennella described the various services that TopView provides. One of the Certiflight outcomes is a UTM Box prototype which was developed and tested in real-world conditions. The gaps identified during the project are linked to having more GNSS chipsets on the market at the right quality and price while at the same time offering functionalities like OSNMA. To summarise, Mr Mennella highlighted the need for exchange data with legal value, lower cost of OSNMA and multi-constellation capable GNSS receivers (20-30€ per unit).

14:15 – 15:00 iConspicuity, Emmanuel Davidson (AOPA France)

Mr. Emmanuel Davidson, AOPA France, thanked Vladimir for highlighting that today's discussion centres on the convergence of two different projects: anti-collision measures for general aviation and the implementation of U-space. These are two subjects with distinct goals and requirements, which helps explain why general aviation may not fully align with EASA's proposals. While EASA is exploring ADS-L, Mr. Davidson reiterated that the fundamental question remains whether it can be safely deployed. Their belief is that safety could be significantly improved if drones could transmit conspicuity information. Mr. Davidson also addressed the feasibility of deploying UAT in Europe, noting that EASA's stance appears to be evolving. Initially, the response was that UAT was "not possible," but now, some countries such as Finland and Norway are making strides toward developing situational awareness systems. He stated that it is plausible a system which could be in place by 2026.

14:15 – 15:00 iConspicuity, Urban Mäder (FLARM)

Mr. Urban Mäder, FLARM, began by highlighting the importance of conspicuity which is fundamentally linked to safety. The introduction included an overview of the working principle, where Mr. Mäder explained that it incorporates a visual situational specification as well as collision avoidance and active alerting features. Mr. Mäder noted that although drones typically operate at relatively low altitudes, there remains a risk of collision with manned aviation, making it essential to detect aircraft. This necessity leads to the introduction of ADS-L, which Mr. Mäder described. He presented a chart illustrating the current electronic conspicuity solutions deployed highlighting the number of clients per channel and per aircraft type. Mr. Mäder then provided an illustrative overview of the future ecosystem with the integration of U-space, noting that the 'new world' will be much more complex. He concluded by noting that we are at the early stages of the new deployments and the main challenges currently lie in the commercial incentives.

iConspicuity, User needs and requirements discussion

The iConspicuity sessions featured number of speakers including EASA, electronic conspicuity manufacturers and operators of manned and unmanned aircraft. EASA presented the use cases and various technologies that could be used. Dronetag highlighted the importance of OSNMA and presented their user needs, particularly better positioning enabled by HAS and more available GNSS modules to minimise navigation errors. The limited number of OSNMA-capable and multi-constellation receivers was also highlighted by TopView. Currently, very few lower-end solutions are available on the market.

Mr. Church highlighted the importance of iConspicuity as an enabler to support new airspace user integration and invited participants to use the slido survey to provide comments and detail their requirements. Ms. Peña noted that many speakers mentioned that HAS and OSNMA are needed but that capable receivers are currently not on the market as mentioned by the users. She appreciated that this is important feedback which will be addressed by EUSPA.

The results of input on the survey on iConspicuity showed that users consider availability (50%) and integrity (43%) as key parameters. Accuracy, continuity and latency were considered less important. The 84% of users think they would benefit from using OSNMA to support the integrity of GNSS. There is a diversity when it comes to preferred iConspicuity solutions, with 54% of users opting for RemoteID/NetworkID[3] and the rest split between ADS-L, ADS-B, FLARM, ADS-B UAT or other solutions. The poll has revealed that altitude reference might be point to address when it comes to integrating manned aviation and drones within the same airspace. The 50% of users use reference to main sea level (AMSL), the 21% to the ground (AGL) and the 29% of users use other altitude reference. The survey was completed by 14 participants.

Mr. Mennella highlighted the need for tracking from a legal perspective and a need for exchanging data with legal value, lower cost of OSNMA and multi-constellation capable EGNSS receivers (20-30€ per unit). He emphasised the importance of choosing the right antenna for drones (Helix antennas vs patch) and trade-offs with mitigating multipath in urban environments. Mr. Mennella proposed to expand operations through wider use of LTE (e.g. 5G).

15:00 – 15:40 RFI – Jamming & Spoofing, Ettore Canestri, Fabien Frossard (EUSPA)

Mr. Ettore Canestri, EUSPA, presented the topics to be discussed, including Dual Frequency Multi-Constellation (DFMC), SBAS authentication or RFI monitoring landscape. An example of spoofing near Russian border was presented. In the case of spoofing, the ADS-B Out showed aircraft flying in circles.

[3] *RemoteID and NetworkID are solutions exclusively for drones and are not expected to be used by manned aviation.*

Mr. Canestri highlighted the usefulness of OSNMA to identify such events and noted the importance of DFMC SBAS in aviation. To address this, Galileo SARPs, ARAIM SARPs and DFMC SBAS SARPs were published in 2023. The DFMC MOPS (ED-259A) were also published in 2023 by Eurocae. A DFMC receiver prototype was developed for aviation. The revision of the ED-259B should be finished in 2025.

The SBAS authentication based on (TESLA) protocol was presented. SBAS authentication will have symmetric cryptography where cryptographic material is shared through hash point with delayed release. That means receiver needs sufficient time synchronisation to confirm received message that was sent at correct time and was not delayed. This will be delivered through message authentication codes developed for every message and will be sent every six seconds which cover five previous messages. The receiver protocol will be used and authenticate SBAS data in principle, before it is used to determine aircraft position. The standards will enable SBAS authentication on both SBAS frequencies (L1 and L5) but require processing additional Message Types under definition in ICAO. It was remarked SBAS Authentication will be an optional feature for SBAS Service Providers, and the concept being standardized is fully backward compatible with the legacy service.

Mr. Frossard continued the presentation with an RFI introduction where he outlined the achievements using a bulleted timeline since 2014 and explained that they are establishing and elaborating the ground network. They have 3 commercial companies, namely Unseenlabs, HawkEye and Spire which already incorporate the preliminary services which will be developed later. He shows this to highlight that they are advancing swiftly. Additionally, showcasing the pace even further, they have two proposals in place for RFI Monitoring. To conclude, Mr. Frossard states that, although it is not fully defined yet, the service will be available in France in 2026.

15:00 – 15:40 RFI – Jamming & Spoofing, José Luis Madrid (ENAIRE)

Mr. José Luis Madrid, ENAIRE, presented ENAIRE's activities in monitoring GNSS performance and RFI (Radio Frequency Interference). Currently there are 37 stations (and growing) to monitor GNSS performance and RFI at Spanish airports. Besides, in the main airports and TMAs (Terminal Manoeuvring Areas) ENAIRE is deploying a system with RFI detection and localization capabilities called DYLEMA. The specification of the system started in 2017 and since 2020 is operated 24/7 from Madrid. The main lessons learned from using DYLEMA include real time monitoring and successfully prompts alerts to ATC service. RFI events of less than 2 min are the most frequent but usually not harmful to aviation. Currently the second generation of the system is in development and deployment in Mallorca with improved monitoring capabilities. Further initiatives include HAPS and drones to monitor RFI interference in cooperation with EuroHAPS and other entities.

15:00 – 15:40 RFI – Jamming & Spoofing, Jeremy Bennington (Spirent)

Mr. Church invited Mr. Jeremy Bennington from Spirent to present, where Mr. Bennington began by stating that detection is currently a 'critical piece of the puzzle'. He provided context on jamming and spoofing, explaining that the aim is to provide a single, nonbiased data interface to help the aviation industry understand the threats, wherever they are flying, as interference can occur anywhere. Nonetheless, Mr. Bennington cautioned that it could take years, if not decades, for aircraft to be properly equipped for these challenges.

Mr. Bennington further noted that spoofing areas are constantly changing, and it is hence essential to develop accurate alert systems for aircraft. Given that different aircraft use different GPS systems, the data collected from them is crucial in mitigating these threats. Mr. Bennington illustrated this by sharing an example of how a loss of GPS accuracy caused an aircraft to go off course. He demonstrated how the GPS spoofing occurred in this instance and reinforced the need for comprehensive aircraft

data to improve alert systems. Mr. Bennington stressed that addressing these threats requires integrating data from various sources, including enhancing satellite capabilities in addition to using ADS-B. While he briefly expressed reservations about making such data public, he suggested it should be shared on a 'need-to-know' basis. Additionally, he highlighted the importance of considering the impact of these threats on other systems beyond GPS. According to Mr. Bennington, it is also critical to alert pilots to the location of RFI is, while cautioning against the outright dismissal of GNSS.

Lastly, Mr. Bennington briefly commented on the progress made in addressing these challenges for unmanned aircraft, though he acknowledged that significant gaps remain.

RFI Jamming & Spoofing, User needs and requirements discussion

In summary, EUSPA presented current developments of DFMC and SBAS aviation framework and outlined two proposals for monitoring RFI. The proposed solution to mitigate RFI stands on two pillars – GNSS receiver robustness through using DFMC and SBAS; and the RFI monitoring service provided at EU-level allowing members states to collaborate in collecting data, monitor RFI occurrences and mitigate impacts. ENAIRE presented their capabilities of monitoring RFI and specifically mentioned RECNET, DYLEMA and GIADL DRONE/HAPS systems. Mr. Bennington from Spirent presented how spoofing can be detected and the risks it brings to manned aviation. To mitigate spoofing attacks, Mr. Bennington suggested that the industry is careful of what is shared within a public domain and more data is collected about GNSS spoofing events. He further highlighted the need for testing and development of robust receivers and antennas, followed by appropriate and up-to-date PNT standards.

The jamming and spoofing user needs confirmed by participants are centred around:

- **Testing and development:** testing antennas and receivers to develop solutions;
- **Awareness maps:** displaying affected areas, number of aircraft affected and related statistics;
- **On board detection and alerting:** spoofing alerts for the crews;
- **Antennae's resilience:** Majority of jamming/spoofing originates from the ground; Shielding the antennae to prevent ground-based jamming may decrease the probability (CRPA antennas);
- **Encryption and Authentication:** OSNMA is one of the solutions offered by Galileo;
- **Alternate/complementary PNT** system in case of GNSS outages;
- **Multi-Constellation Multi Frequency** future development adding specific spoofing algorithms.

The results of the user survey revealed that several respondents have experienced jamming or spoofing when flying. As a result, all of them have implemented a contingency or mitigation plan. The potential solutions for RFI mitigation, as considered by users, could include DFMC receivers, OSNMA, SBAS authentication or CRPA (Control Reception Pattern Antennas). All of which require additional work on certification for manned aviation and the development of receivers capable of supporting such mitigation measures. The survey was completed by 7 participants.

15:40 – 16:00 Air quality around airports, Arnis Kadakovskis (EUSPA)

Mr. Kadakovskis introduced the 'Air quality around airports' session and explained why EUSPA is interested in collecting the user requirements for this application. He proceeded to invite Mr. Koen Meilink, S&T, to present.

15:40 – 16:00 Air quality around airports, Koen Meilink (S&T)

Mr. Meilink focused his presentation on air quality around airports. He provided some context highlighting the importance of clean air as it impacts human health but also our ecosystem. He proceeded to reveal that aviation is a large contributor to the reduced air quality and that emissions in aviation have increased given the significant increase in passengers over the last years. S&T discovered that two key stakeholders in the industry have the largest impact, namely the airport operators and environmental inspection agencies. They conducted stakeholder consultations and Mr. Meilink presented the key conclusions which includes creating linkage to legislation with airports and their surroundings as well as non-CO2 emissions such as PM2.5, NO2, SO2 and O3 and the increasing relevance in air quality monitoring near airports. In support of this, he showcased a table with pollutant types depicting the impact on air quality.

After describing the scope of their work and some challenges, Mr. Meilink listed applicable Copernicus products including CAMS, Urban Atlas, Corine and Era5 for their processes. One of the solutions he introduced is a local air quality monitoring system where they collect data, fuse it and create an air quality model to then develop it into an operational service. Mr. Meilink finished by clarifying that combining all of these into an application brings appropriate insights, hence allowing for appropriate actions to be taken.

Mr. Meilink noted that the data is there, of course better quality is wanted, but to comply with the current regulation it is more important to find the right solution. Airlines are looking for solutions (e.g. electric engines for taxiing). In aviation, safety is the number one priority, but it is still important to address environment as well. To respond to Mr. Kadakovskis' question, there was a case in US where lawyers sued an airport for pollution. He assumed that an aggregated effect is becoming more significant.

Air quality around airports, User needs and requirements discussion

The survey revealed that some stakeholders have a voluntary air quality monitoring system in place. The reporting is provided to variety of stakeholders including local communities and government/regulators. In general, users requested finer spatial and temporal accuracy. The survey was completed by 6 participants.

16:00 – 16:30 Copernicus for procedure design, Adrian Sanchez (ESSP)

Mr. Argueso introduced the session on EO for procedure design. Mr. Adrian Sanchez, ESSP, presented himself and explained the aim of his presentation. Mr. Sanchez presented the ICAO Annex 15 – Chapter as the key procedure design-related legislation. The understanding of terrain is important for a number of applications (e.g. TAWS, charts, etc.). Mr. Sanchez further highlighted the need for very precise data. The needed accuracy can by down to 1 m in Area 4. Mr. Sanchez proceeded to present the Copernicus DEM technical characteristics and noted that information is available in the Copernicus product handbook.

Mr. Sanchez noted that the Copernicus DEM is useful for aviation as it can provide better accuracy compared to free Global DEMs, can provide potential cost savings and offers homogeneous data regardless of national borders. It can be used for flight procedure design or feasibility analyses.

16:00 – 16:30 Copernicus for procedure design, Laurence Hawker (Fathom)

Mr. Argueso opened the session and introduced Mr. Lawrence Hawker, Fathom, who presented on a global digital terrain model called FABDEM. Mr. Hawker began by explaining key terms, including the

Digital Elevation Model (DEM), which encompasses both the Digital Surface Model (DSM) and the Digital Terrain Model (DTM). He then proceeded to focus on FABDEM, firstly explaining that it is a digital terrain model which removes surface artifacts from Copernicus DEM. Mr. Hawker stated that it is a better baseline elevation product before continuing with a description of the FABDEM Method. Furthermore, Mr. Hawker introduced FABDEM+ which takes FABDEM but includes LiDar data to provide much better elevation data. He proceeded to compare FABDEM to other DEMs where SRTM is quite heavily biased, Copernicus is better, and FABDEM is even better. He then showed that adding the LiDAS data improved it even further. Mr. Hawker showcased a plot to compare them all, providing final visual justification that FABDEM+ is the best option.

16:00 – 16:30 GHS-POP, Fernando Argueso (EUSPA)

Mr. Argueso explained how GHS-POP data can be used when assessing the impact of flight procedures on population. He referred to ICAO Doc 9906 which requires an assessment of the impact on the population. The data for the latter can be used by airport operators as originators of noise impact and by municipalities as receivers of noise.

Ms. Krywanis made a comment noting that in Frontex they are developing a product related to Copernicus' based permeability model. She mentioned that Frontex has models currently under development and can provide reports on border permeability upon request, which may be of interest to the participants.

Copernicus for procedure design, User needs and requirements discussion

In summary, Mr. Argueso recapped the findings of EUSPA, more specifically, Copernicus DEM GLO-30 satisfies Area1 and partially Area2 requirements. Copernicus is a reliable and recognised source of data where site survey is not feasible. This complemented the presentation from ESSP on how the Copernicus DEM can meet aviation's requirements for terrain data. The FABDEM and FABDEM+ were presented as Digital Terrain Models (DTM) based on the Copernicus DEM, but enhanced by the use of machine learning which could also be used to meet the ICAO Annex 15 requirements. One of the participants correctly noted that *"FPD service must meet requirements from 2017/373 EU rule. In this rule (Annex 3) is included the Data catalogue description. This DEM should allow to meet these requirements."*

The survey revealed that DTMs are most used by flight procedure designers (57%). 29% of responses noted they do not use either of the mentioned datasets. The digital elevation models used for flight procedure design include Global data sets as NASA SRTM, National elevation models or any other suitable commercial product. Many environmental assessments consider population density (71%), however, 83% of the respondents need better resolution and/or revisiting times with only the remaining 17% content with the current performance. There is no preferred attribute as 43% of users see high resolution, revisiting times and seasonality equally important. If not possible to improve all, increased resolution should be a priority as it was placed second highest with 29% of votes. The survey was completed by 7 participants.

16:30 – 17:00 Conclusions and closing remarks, Fernando Argueso (EUSPA)

Mr. Argueso thanked all the participants and proceeded to summarise the manned aviation session. He highlighted the main points raised by EASA, especially on ADS-L and UAT solutions. Galileo differentiators could be useful in future development of iConspicuity solutions. The threat of RFI is highlighted along the potential solutions for mitigation. Finally, the impact on environment is likewise highlighted as an important topic and Copernicus can contribute to mitigating the impact of aviation.

Ms. Peña thanked all the participants, speakers and the moderator for contributing together to improving the EGNSS and EO systems. She reassured everybody that all points will be included in the MoM and noted that the presentation will be shared will all participants. Further feedback can be provided through surveys on EUSPA's website. Links can be found in the slides. Finally, Ms. Peña reminded everyone about the Plenary taking place on the 14th of October.

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