



European
Global Navigation
Satellite Systems
Agency



GALILEO **EGNOS**

NAVIGATION SOLUTIONS
POWERED BY EUROPE

MyGalileoDrone competition Webinar

From disrupting ideas to innovative solutions

Katerina Strelcova, Aviation Market Development Innovation Officer,
European GNSS Agency (GSA)

Elena Megías Farré, Galileo Service Center (GSC)

04 August 2020

Agenda



- ☐ GSA & GNSS Introduction
- ☐ GSA MyGalileoDrone contest
- ☐ How to apply? + Eligibility, Exclusion & Award criteria
- ☐ Galileo services
- ☐ Galileo for drones
- ☐ Questions?



GSA MyGalileoDrone



• Who are we?

Mission:

Gateway to Services

- Galileo & EGNOS Operations and Service Provision
- Market Development of the applications and the receivers

Gatekeeper of security

- Security Accreditation
- Operation of Galileo Security Monitoring Centre, governmental service (PRS) activities

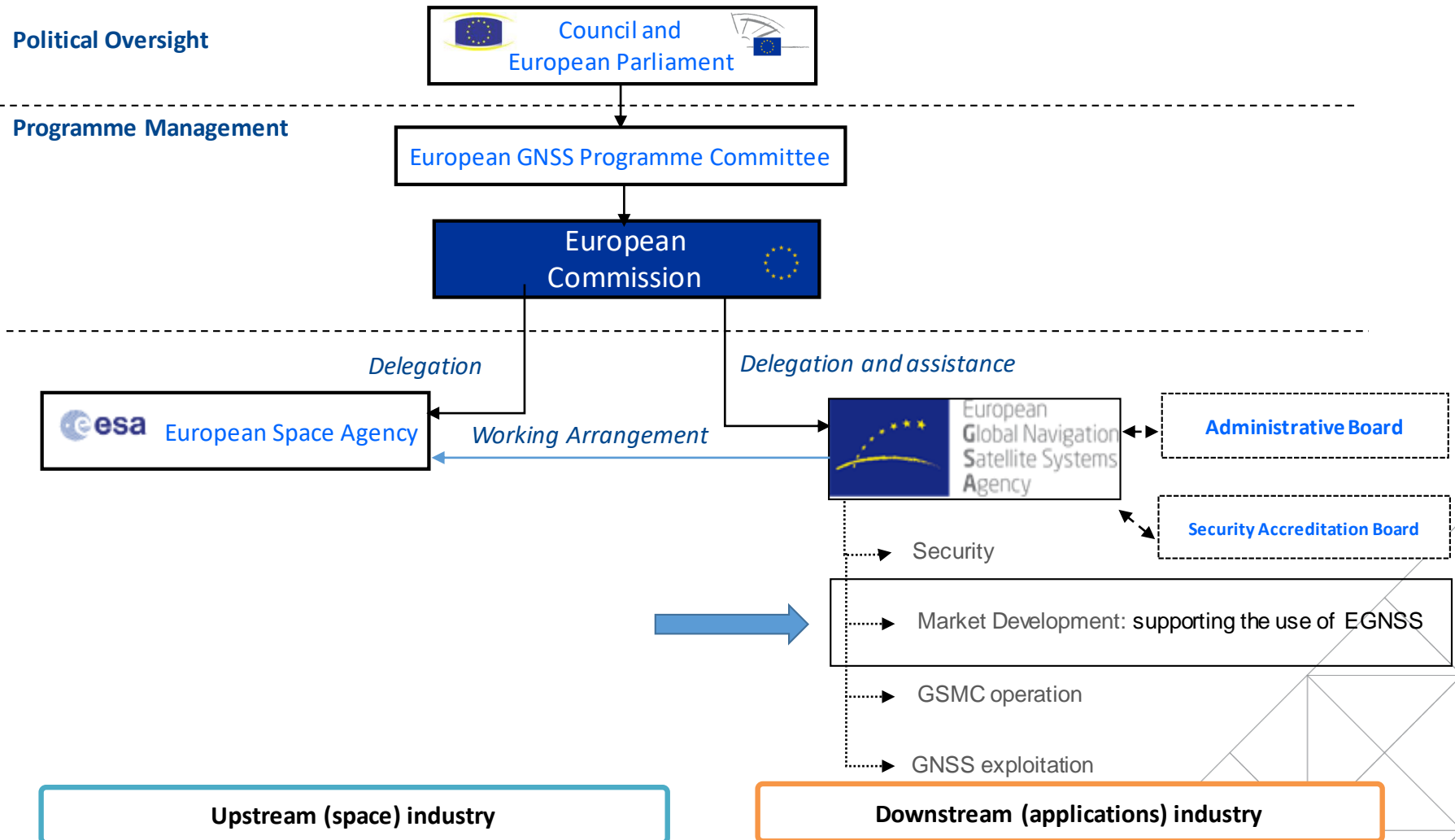
Resourcing:



GSA MyGalileoDrone



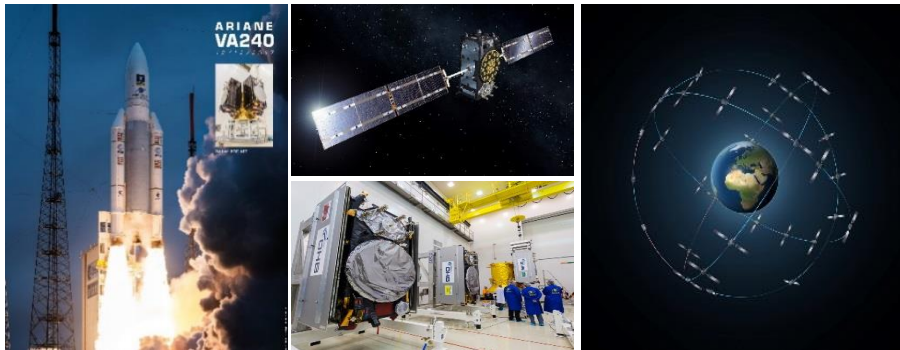
- Who are we?



GSA MyGalileoDrone



European Satellite Navigation Programmes



- Global Navigation Satellite System (GNSS)
- Autonomous infrastructure under EU civilian control
- 26 Satellites in the constellation today

- European Geostationary Navigation Overlay System
- Increased accuracy and integrity over GPS
- Next version will augment Galileo

GSA MyGalileoDrone

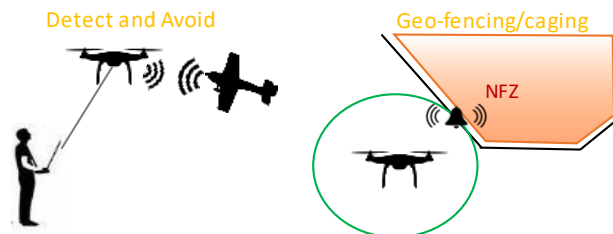


- EGNSS for drones

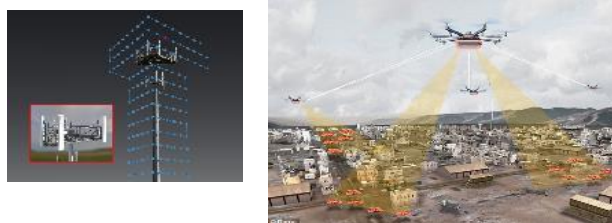
Increased availability



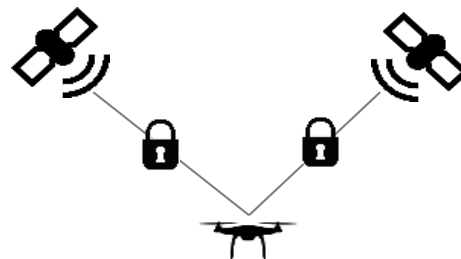
Increased accuracy and integrity



Unprecedented high accuracy for new demanding applications



Embedded authentication features



GSA MyGalileoDrone



#MyGalileoDrone contest is open!

The aim of the contest is to design, develop, test and prepare for commercial launch a drone-based application and/or service able to provide a position and/or time fix by using Galileo-enabled receiver.

Flexibility using
Galileo

Galileo can be used in drones, smartphone apps, payloads, or in any other devices supporting a Galileo drone application.

The banner features a woman in a red and black plaid shirt and a grey cap, looking up at a drone flying in the sky. The background shows a vineyard and mountains. The text 'myGalileoDrone' is prominently displayed in the center. Below it, two dark blue boxes contain the contest details. In the top right corner, there are logos for the European Union, the European Navigation Satellite Systems Agency, and the European Global Navigation Satellite Systems Agency.

myGalileoDrone

Do you have a **drone-based application** idea?

Do you have what it takes to win **100.000 €**

European Union European Navigation Satellite Systems Agency European Global Navigation Satellite Systems Agency

GSA MyGalileoDrone



Why MyGalileoDrone contest?



Support start-ups & entrepreneurs in Europe



Stimulate drone application developers
& service providers to learn about Galileo



Bring new innovative applications to market



GSA MyGalileoDrone



Application/service targeting EU priorities

Drones for the European Green Deal



- Robust drone automated navigation solutions
- Smart mobility: urban air mobility, package delivery
- Sustainable maritime and railway transportation
- Field to Fork strategies
- Preserving Europe's natural environment

Drones for the European Digital Strategy



- U-Space services leveraging artificial intelligence
- Internet of Things
- Drone services to enable digital connectivity
- Synergies between 5G and Space data
- Efficient and digital surveying
- Infrastructure inspection & maintenance

Drones to Protect our European way of life



- Efficient search and rescue operations
- First aid drones and medicine delivery
- Support to migration processes and border operations

Drones for Resilience and European Recovery



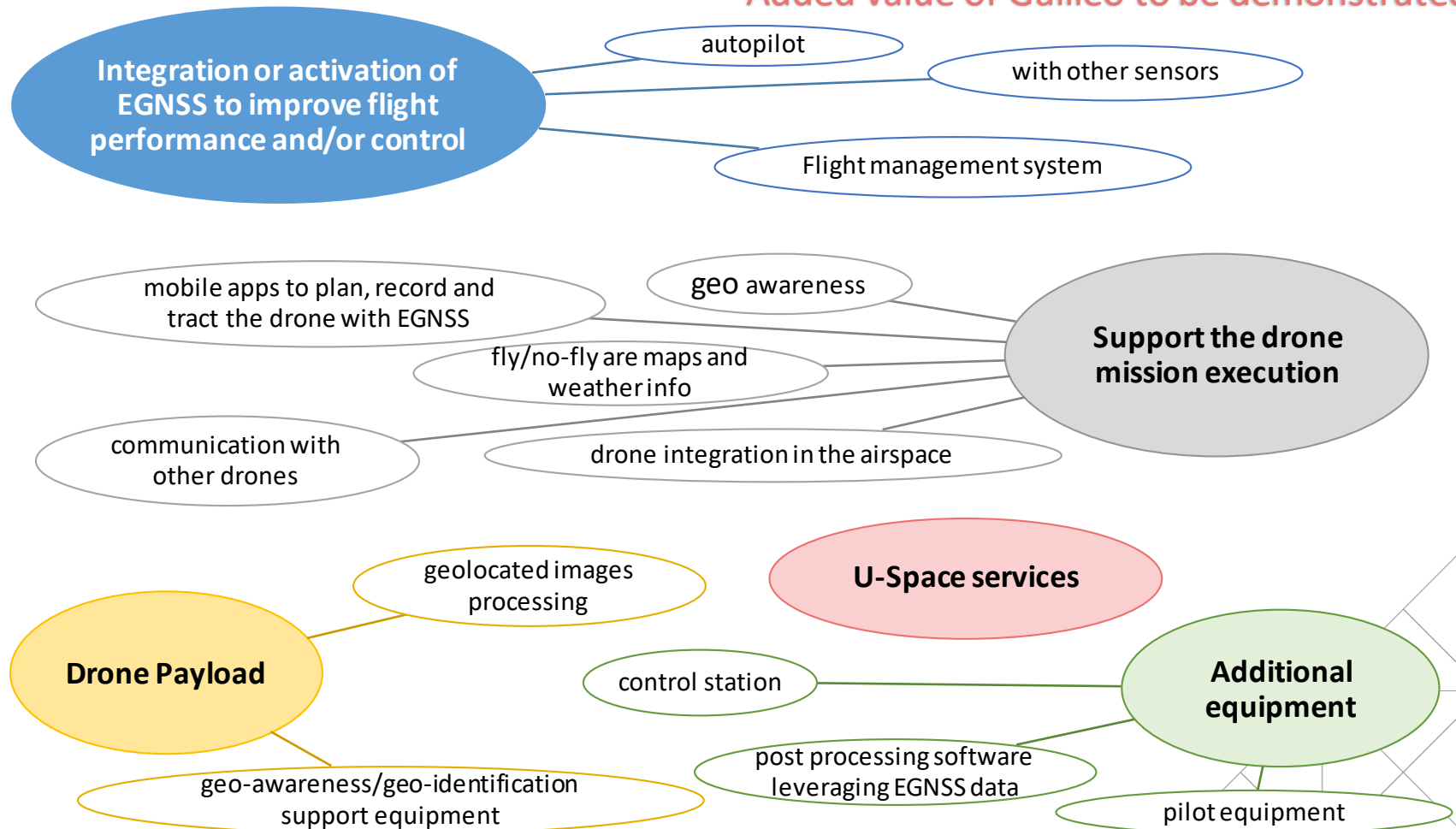
- eHealth: e.g. delivery of samples, tests, disinfection
- Support for safe tourism
- Food production: e.g. crop monitoring
- Support for production & inspection

GSA MyGalileoDrone

Use of Galileo for your application/service



Added value of Galileo to be demonstrated



GSA MyGalileoDrone

3 Phases of the contest



Phase 1: Call for ideas

17th July – 31st August



Ideas for application



Administrative documents

Phase 2: Development/prototyping

15th Sept - 30th Nov 2020

Demo version

Video of the app

Logs of the flights



Phase 3: Finals

28th January 2021



Presentation to GSA evaluation board



Demo

How?

- Finals at the GSA/EU location
- Demo flight
- Network of investors by the GSA

BOOK YOUR CALENDAR
for Webinars:

4th August 10am

17th August 10am






HOW TO APPLY?

GSA MyGalileoDrone



Phase 1: Call for ideas

17th July – 31st August 2020

- ✓ Idea 
- ✓ Submit a proposal describing the plan for developing an application or service, including:
 - ☐ [Application form with the technical description](#)
 - ☐ [Declaration of honour on exclusion](#)
 - ☐ [Financial Identification Form](#)
 - ☐ [Legal Entity Form](#) *

** Every natural person participating within a team shall submit a “Natural Person” form + a copy of their own ID. Persons representing a legal entity shall submit a “Private Company” or “Public Law Body” form for the legal entity they represent + a copy of their own ID.*

For more detailed information go to: [Terms of Reference](#)

GSA MyGalileoDrone

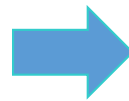


Phase 1: Call for ideas

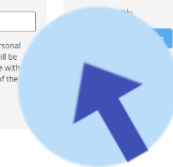
Submit a proposal to: <https://www.gsa.europa.eu/MyGalileoDrone>



The banner features a woman in a red plaid shirt looking up at a drone flying over a vineyard. Text on the banner includes: "myGalileoDrone", "Do you have a drone-based application idea?", "Do you have what it takes to win €100.000?", "The aim of the contest is to design, develop, test and prepare for commercial launch a drone-based application", "€ 100.000 1st PRIZE", "196 DAYS", and "SEL". Logos for the European Union and GSA are also present.



The registration form is titled "myGalileoDrone competition". It includes a "Welcome to myGalileoDrone competition!" message with instructions: "Register an account.", "Start your entry.", "Complete the Application form.", and "Submit your entry to be judged. Good luck!". It also mentions "For further information, please visit myGalileoDrone website." and includes social media icons for LinkedIn, Facebook, Twitter, and YouTube. The form has two sections: "Register" and "Log in". The "Register" section includes fields for "First name", "Last name", "Email", "Password", and "Confirm password", along with a checkbox for "I understand and agree that the personal data I provide for the registration will be processed by the GSA in accordance with privacy statement under section 6 of the competition Terms of Reference." and a "Register" button. The "Log in" section includes fields for "Email or mobile" and "Password", a "Remember me" checkbox, a "Log in" button, and a "Forgot password" link.



Register



- The proposals will be evaluated by the GSA's evaluation board
- Max 30 projects will be chosen for the Phase 2: Development
- Selected teams will be announced on the official website

For more detailed information go to: [Terms of Reference](#)

GSA MyGalileoDrone



Phase 1: Call for ideas

Submit the proposal to: <https://www.gsa.europa.eu/MyGalileoDrone>

For more detailed information go to: [Terms of Reference](#)

GSA MyGalileoDrone



Phase 2:
Development/prototyping

15th Sept – 30th Nov 2020

- ✓ Selected teams are developing a demo version of the proposed application and/or service
- ✓ The demonstrator shall implement the general concept, prove feasibility via a flight in a representative scenario and provide a test report

What to include in the package? Turn to the next page

- ✓ You will receive technical support during the development:



- lists of [Galileo capable drones](#) and receivers
- dedicated API to facilitate the use of GNSS raw measurements



- online mentoring sessions with the technical and business advisory team, on GNSS, drone operations and safety aspects

For more detailed information go to: [Terms of Reference](#)

GSA MyGalileoDrone



Phase 2: Development/prototyping

Submit the **demonstrator** & don't forget to include:



- ☐ Detailed description of the application/service
- ☐ Flight tests definition and operations performed
- ☐ Drone & additional equipment configuration – which GNSS receiver or Galileo equipment is used?
- ☐ Video of demonstration in flight → show the application in a simulated scenario!
- ☐ Recorded logs/proof of Galileo use in drone or other equipment during the demonstration
- ☐ **Are you developing a software application?** → Submit the demo version of the app, showing its functionalities and the report of testing results



- The **demonstrators** will be evaluated by the GSA's evaluation board
- **Max 10 projects** will be chosen to the **Phase 3: Finals**
- Selected teams will be announced on the official website by **15 December 2020**

For more detailed information go to: [Terms of Reference](#)

GSA MyGalileoDrone



Phase 3: Finals

- ✓ Selected teams will be invited to the official award of the "MyGalileoDrone" 2020 competition
- ✓ Selected teams will:
 - ✓ present their application/service, including a roadmap of the request to the relevant authority for the authorisation to deliver commercial services *(if needed)*
 - ✓ perform a demonstration of the application/service, **including flights**



- The winners will be selected by the GSA's evaluation board based on the award criteria published
- The winners will be promoted in official channels

For more detailed information go to: [Terms of Reference](#)

GSA MyGalileoDrone



- 4 Main Prizes



GSA MyGalileoDrone



Eligibility criteria

Teams:

- ideally from 1 to 7 participants
- composed by natural persons or legal entities
- must appoint a team coordinator to serve as the central contact point and represent the team towards GSA.

Natural persons applicants shall be EU Members States citizen or citizen of Switzerland or Norway. All applicants must be at least of 18 years of age by the date of registration to the contest.

In the case of legal entity, its central administration or registered office must be located in the EU Member States or in Switzerland or in Norway.

More information [here](#).

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Exclusion criteria

The contest is not open to entry where prohibited or restricted by law and is **not open to employees of GSA, EC and ESA or to immediate family members** (spouses, domestic partners, parents, grandparents, siblings, children and grandchildren) of employees of GSA, EC and ESA or to employees or immediate family members of any of their respective affiliates.



In addition, all applicants shall be able to sign **the Declaration of Honour (Annex 1)** to be allowed to participate to this competition.

GSA MyGalileoDrone



Award criteria

Innovation (0-5): Is this kind of application/service not yet available on the market? Is the application technologically advanced (e.g. using multi-frequency, innovative algorithms)?

Market potential (0-5): Is this application/service sellable after repackaging this idea into a real service? Is there a potential market demand/customer base for this product?

Galileo relevance (0-5): Is the application/service making use of Galileo? Is the increased accuracy offered by Galileo relevant for the application? Is the increased robustness provided by multi-constellation / multi-frequency relevant for the application?

Technical feasibility and service readiness (0-5): What is the level of progress since the start of the contest? Has the required level of completion for the phase been fully achieved? Is the application/service ready to be delivered in the market?

Address regional development needs (0-5): Does the solution address the needs of regional markets or improve the offer available in regional markets for the services proposed to be provided by the drone-based solution? In case additional authorization are needed from the relevant national authority, are they identified and is the plan to achieve them credible?

GSA MyGalileoDrone



- Do you have questions on the scope of the competition or Terms of reference?

- for additional information write to prizes@gsa.europa.eu
- Subject: 'MyGalileoDrone 2020' + name of your team



Send the requests for additional information as early as possible before the deadline of each phase.

Also, we are on:



Join myGalileoDrone on Slack

Start by entering the email address you use for work.

GSA MyGalileoDrone



Where to find useful information?

- ❑ List of drones using Galileo capable receivers: <http://www.usegalileo.eu>
- ❑ The GSA website: <https://www.gsa.europa.eu/>
- ❑ Application form: <https://mygalileodrone.awardsplatform.com/>
- ❑ Contest website: www.gsa.europa.eu/myGalileoDrone

OTHER RESOURCES AND USEFUL LINKS

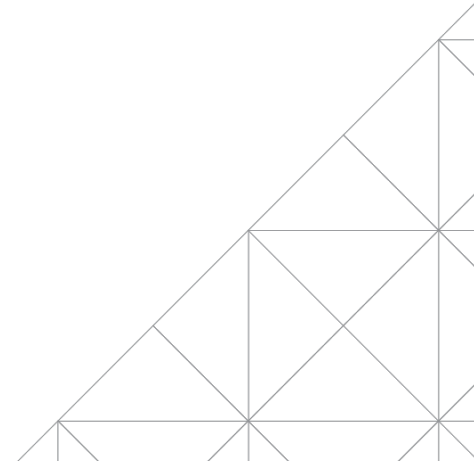
Drones Operations White paper

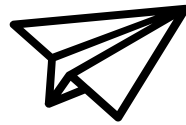
Raw measurements white paper

Database of raw measurements

The forum of raw measurements task force

Glossary for GPS test





Thank you for your
attention and now some
technical details...



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GALILEO **EGNOS**

NAVIGATION SOLUTIONS
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Galileo services

Galileo for drones

Introduction to Galileo Services



- Initial Galileo Services declared on the 15th of December 2016, entailing Galileo in Operational phase and the initial provision of:

Galileo Open Service (OS)

Free of charge ranging, positioning and timing service.



Search and Rescue (SAR)/Galileo

Contribution to the Cospas-Sarsat MEOSAR program through the provision of a Forward Link Alert Service.



Galileo Public Regulated Service (PRS)

An encrypted navigation service for governmental authorised users and sensitive applications that require high continuity.



- Galileo Enhanced and FOC (Full Operational Capability) Services:

Search and Rescue (SAR)/Galileo

- Introduction of Galileo Return Link Service (RLS) Ack Type-1 declared the 21st of January 2020
- Additional RLS functionalities expected
- Free of charge



Galileo High Accuracy Service (HAS)

- Free of charge service that will provide corrections through the Galileo signal.
- Position accuracy in the order of decimetres.
- The provision will be through the E6-B signal.



Galileo Authentication Service

- OS-NMA:** Free of charge service that will provide authentication of the navigation data. Inserted into the E1-B signal.
- Signal Authentication Service (SAS):** encryption of the Galileo signals (ranging codes). The provision will be through the E6-C signal.



Galileo system and Services information



Complete description of the Galileo system and Services is available within the European GNSS Service Centre (GSC) Web Portal <https://www.gsc-europa.eu/>

Galileo General Description

Galileo Official Documentation

Galileo System & Services Status

[GSC Helpdesk](#) service via Web portal

Or GSC Helpdesk via email helpdesk@gsc-europa.eu



Access to the website and [register](#) to receive the complete [set of services](#)

<https://www.gsc-europa.eu/>

GNSS and drone operations



GNSS as a key enabling technology for drones:

- Use of GNSS for navigation purposes, enabling the use of GNSS waypoints to follow the trajectory defined in its mission
- Especially relevant for the unmanned air traffic management system to unlock BVLOS (Beyond Visual Line of Sight) operations and to enhance U-Space capacity
- GNSS increasing accuracy and contributing to integrity or a measure of trust on the positioning by a combination with other sensors/technologies (e.g IMU/INS)
- Vertical separation between drones and with conventional aircraft ensured using GNSS as offers improved height accuracy compared with other sensors as barometric pressure altitude sensors (affected by temperature gradients so not providing similar accuracy levels in all situation).
- Other applications enabled by GNSS:
 - “Automated landing” and “Return to home” functionalities
 - Geo-referencing of collected data, for instance, images captured by a camera embarked in a drone
 - In-app taking Geo-fencing, as a key concepts/services to facilitate U-Space implementation

Benefits of using Galileo for drone operations



The introduction of Galileo signals and its future new services leads to additional improvements and new functionalities and capabilities to drone operations:

- Increased Galileo navigation performance Vs GPS only, significantly improving accuracy, availability, continuity and reliability of positioning/navigation solution for drones.
- Additionally, Galileo signals modulation, such as the AltBOC used in E5, introduces higher performance against multipath errors in harsh GNSS environments with limited access to open sky, e.g. drones operating in urban canyons

Errors in flight	95% height error	95% 3D error
GPS	4.4 m	4.5 m
GPS+Galileo	1.3 m	1.4 m

GALILEO vs GPS only



Introducing Galileo in drone operations



The introduction of Galileo in drone operations can be accomplished in several ways:

- Commercial drone model or drone built using components, being equipped with a receiver and/or a flight management system compatible with Galileo (see next slides)
- Smartphone App using Galileo for different drone operations:
 - Flying the drone and controlling the camera on board, e.g. [DJI Go](#), [Litchi](#)...
 - UAS Traffic Management (UTM), providing capabilities required as geo-fencing , flight log, drone mapping, surveillance, etcetera. [Airmap](#) and [Unifly](#) provides these services.
- Payloads integrated with drones and using Galileo (based on PVT solution provided by receiver on board) for:
 - Surveillance within a controlled area by means of ADS-B transmitters on board, for instance [DJI Airsense](#)
 - Photogrammetry operations (drones also equipped with cameras suitable for aerial maps) with RTK modules (on board or as a mobile stations) or LIDAR sensors, e.g. [Trimble](#), [DJI](#), [CHCNAV](#)

Commercial drones with a Galileo-enabled receiver



- Visit [UseGalileo](http://UseGalileo.eu) web portal to:
 - Search commercial receivers Galileo-enabled collected within “[In the Air](#)” section (also included in next slide excel file).
 - Identify smartphones/tablet supporting Galileo listed within “[Going Mobile](#)” section

USE GALILEO.EU
FIND A GALILEO-ENABLED DEVICE TO USE TODAY

Accuracy matters
When close isn't enough, **use Galileo**
Galileo. Navigation made in Europe.

1 484 155 682
Estimated number of Galileo-enabled smartphones today

Click here to find out if your phone is Galileo-enabled

Your smartphone is not alone, discover the other devices that are Galileo-enabled.

Going Mobile (green arrow pointing to the 'GOING MOBILE' hexagon)

In the Air (red arrow pointing to the 'IN THE AIR' hexagon)

The diagram consists of 12 hexagons arranged in two rows. The top row includes: 'ON THE ROAD' (car icon), 'ON THE WATER' (boat icon), 'ON THE TRAIN' (train icon), 'IN THE AIR' (airplane icon, highlighted with a red border), 'ON TIME' (clock icon), and 'INTERVIEW OF THE WEEK' (microphone icon). The bottom row includes: 'GOING MOBILE' (smartphone icon, highlighted with a green border), 'ON THE FARM' (tractor icon), 'ON THE MAP' (map icon), 'DURING AN EMERGENCY' (ambulance icon), and 'SPACE APPLICATIONS' (satellite icon).

Commercial drones with a Galileo-enabled receiver



- The following tables collect the main drone manufacturers as well as a short list including some of the most popular drone currently commercialised

Manufacturers commercialising Galileo-enabled drones	
ADPM	Parrot
Aerialtronics	PRIMOCO
AIRC	Singular Aircraft
Delair	Skycorp
DJI	Sky-watch
Exabotix	Stormbee
Flytech	Squadrone System
Freefly	Topcon
Geoscan	Trimble
MAVTECH	Volocopter
Microdrones	Wingtra
Nimbus	Yuneec

Commercial Galileo-enabled drones
DJI Phantom 4 RTK
Delair UX5 HP
Firefly Alta 8
Hexo+ Hexo Drone 3D
Parrot Bebop Drone
Polynesian Exploration
Polyexplore1-16
Topcon Sirius Pro
Trimble UX5 HP
Wingtra WingtraOne
Yuneec H520

Commercial drones with a Galileo-enabled receiver



- Galileo-enabled commercial drone models



Firefly Alta 8



Delair UX5 HP



DJI Phantom 4 RTK



**Wingtra
WingtraOne**



Topcon Sirius Pro



Parrot Bebop Drone

Enabling Galileo in Drone models locked by default



- There are drone models that, even though are supporting Galileo, by default they require to enable the reception of Galileo satellite signals.
- The guidelines and the SW needed to enable Galileo can be found in drone user manual (see next slide), drone manufacturer FAQs and user or developers forums.
- This is the case for DJI following models:
 - Mavic Pro/Platinum/Alpine White
 - Spark
 - Phantom 4 Pro/Standard/Advanced/Pro V2
 - Inspire 2
- In [Github](#), the platform for developers community, [SW and guidelines](#) is offered for free to unlock limitations introduced by DJI, for instance, the Galileo satellites reception
- Additional support will be provided by GSA/GSC on enabling Galileo in compatible receivers

Enabling Galileo in receivers/flight navigation systems



- Receivers and flight navigation systems, as u-blox Neo-M9N and Drotek Sirius RTK F9P, allow the configuration of GNSS. Similar approach is followed by other manufacturers
- Complete description can be found in:
 - U-blox via U-center [SW user guide](#)

- Drotek RTK F9P [Tutorial](#)

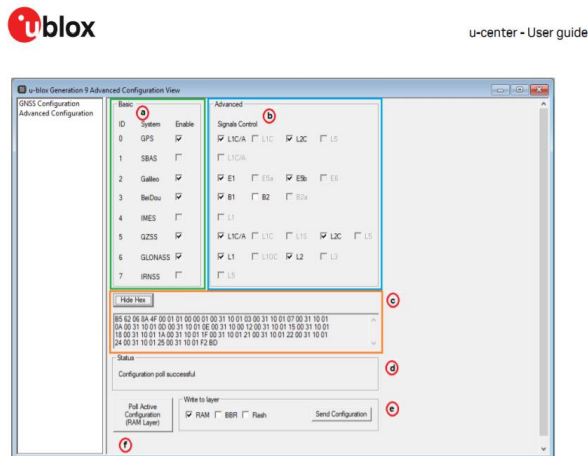
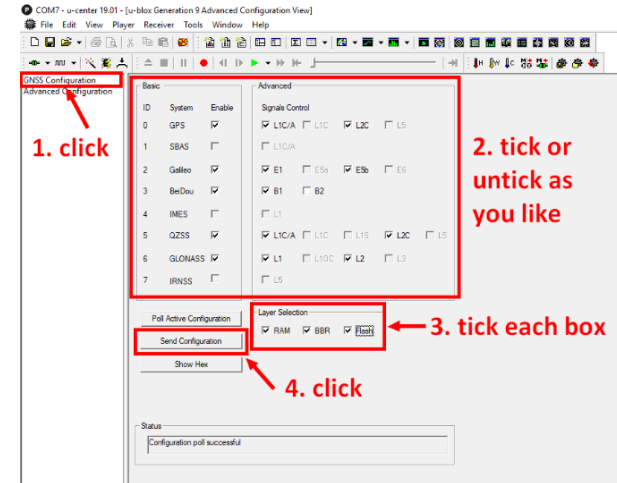


Figure 29: u-blox Generation 9 Advanced Configuration View



Android GNSS Raw Measurements applied to drones



- GNSS Raw Measurements allows Android-based devices the access to GNSS raw data, enabling precise positioning techniques to enhance the accuracy of position calculated by the device based on GNSS signals
- The “White Paper on using GNSS Raw Measurements on Android devices” document, publicly available at GSA web portal (<https://www.gsa.europa.eu/gnss-applications/gnss-raw-measurements/workshops-and-resources>), facilitates the GNSS Raw Measurement exploitation and the development of applications on the Android platform
- This document addresses two main objectives:
 - To share knowledge and expertise on Android raw measurements and its wider use, including its potential for high accuracy positioning techniques”
 - Valorise the Galileo differentiators
- This capability is offered in those Android devices from (and included) Nougat version onwards (API level versions greater than or equal to 24)

Click here to
download the
document



Android GNSS Raw Measurement applied to drones

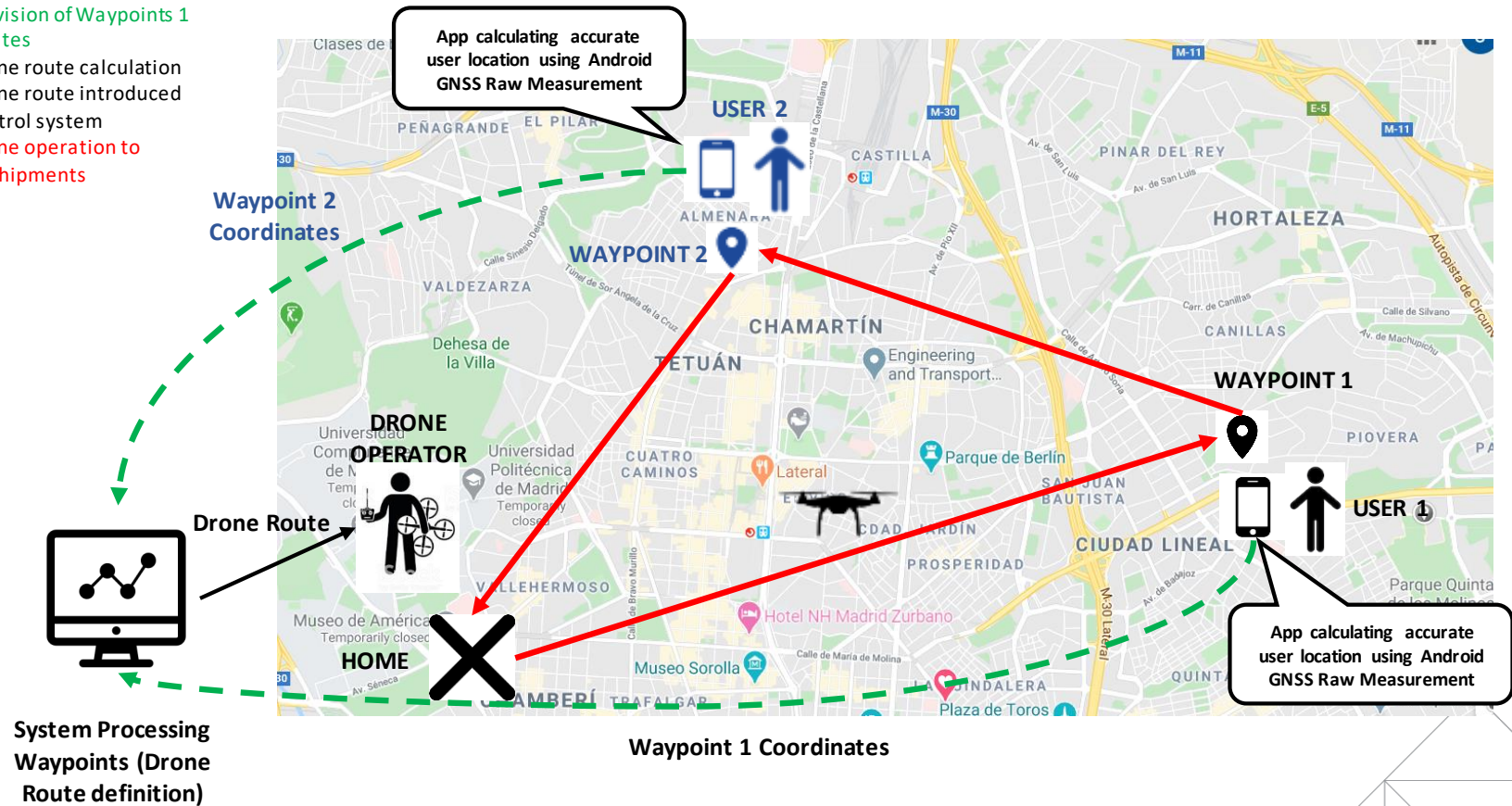


- The following example introduces the definition of an application/service exploiting Android GNSS Raw Measurement:
 - Service is focused on shipment deliveries using drones
 - The service provider develops an App exploiting Android GNSS Raw Measurement
 - This App is provided to the users of this service
 - When an user is the consignee of a package delivery, it is requested to run the App in his/her mobile device (smartphone/tablet).
 - The App sends the accurate location of the consignee to the Service Provided system.
 - This system, based on different parameters (daily plan for deliveries, users locations, drone operation range, etcetera) defines and provides the delivery routes (with the users locations or waypoints) to the drone operator.
 - Then, drone operator introduces these routes into drone control system so the drone automatically flies and delivers the shipment in the locations (waypoints) along the route

Android GNSS Raw Measurement applied to drones



- **Step 1** – Provision of Waypoints 1 & 2 coordinates
- **Step 2** – Drone route calculation
- **Step 3** – Drone route introduced in drone control system
- **Step 4** – Drone operation to deliver the shipments



Companies using drones for different applications and services



- [Skyward](#) provides Drone as a Service (DaaS) software platform that helps commercial drone operators in industries such as agriculture, construction, film production, and telecommunications track, connect, and manage drones.
- [Amazon Prime Air](#), the future delivery system from Amazon designed to safely get packages to customers in 30 minutes or less using unmanned aerial vehicles, also called drones.
- [senseFly](#) drone solutions simplify the collection and analysis of geospatial data, allowing professionals in surveying, agriculture, engineering and humanitarian aid to make better decisions
- [Verge Aero](#) provides events and venues with the power of live drone performances to attract and amaze audiences.
- [VideoDrone](#), manufacturing drones for technical aerial photography, mapping, measurement and survey tasks
- [Dronebydrone](#) providing aerial services (aerial photography, environmental surveillance, emergency response and protection...)

Before we start with the Q&A...



- The GSA has just launched another exciting competition: Geomatics on the Move!
- More info: gsa.europa.eu/geomaticsonthemove

COMPETITION AIMS

A challenge for young innovators across the European Union to bring their Geomatics solutions to life using European satellite technologies, shaping the future of data capture and analysis.



€ 30 000
PRIZE POOL



133
DAYS



10
**SELECTED
TEAMS**

REGISTER

TIMELINE

AWARD CRITERIA

Linking space to user needs



Get in touch:



www.GSA.europa.eu



EGNOS-portal.eu



GSC-europa.eu



UseGalileo.eu



The European GNSS Agency is hiring!

Apply today and help shape the future of satellite navigation!

