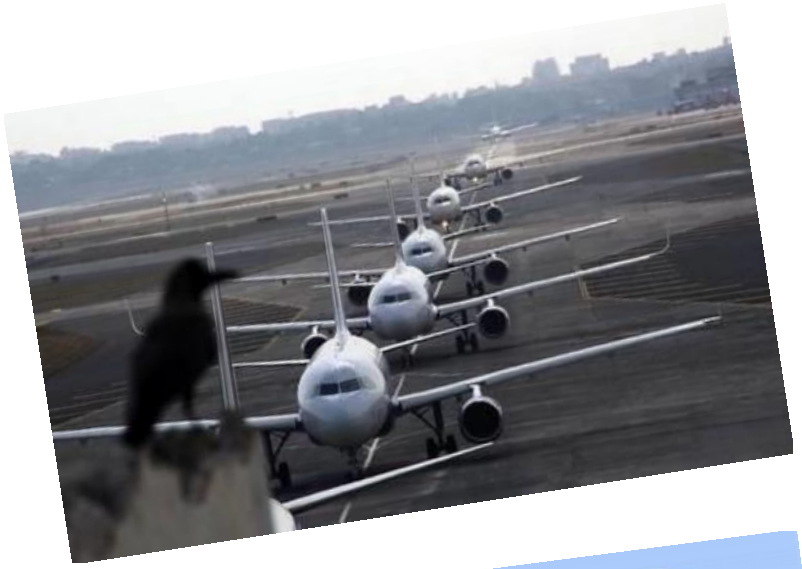
EGNOS in Aviation: Strategy and Implementation Status

Rome - EGNOS Service Provision Workshop

katerina.strelcova@gsa.europa.eu

jose-maria.lorenzo@essp-sas.eu

Aviation is changing and brings new challenges



EGNOS for approaches "everywhere" Increasing ACCESSIBILITY

EGNOS in all instrument runways by 2024 in Europe

-> 646 EGNOS based approaches as of today
-> 51 % IRE operational

EGNOS at non-instrument runways in Europe

-> 2673 airports with non-instrument RWYs

EGNOS for rotorcraft operations

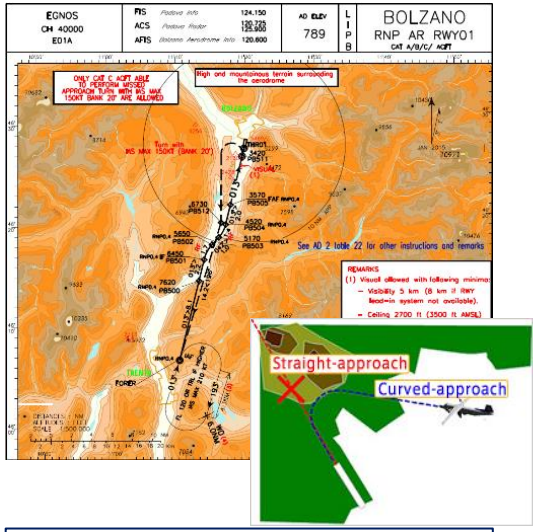
-> EGNOS for PinS in Italy!
-> Low level routes connecting hospitals
-> CS-ACNS Issue 2 (April 2019)

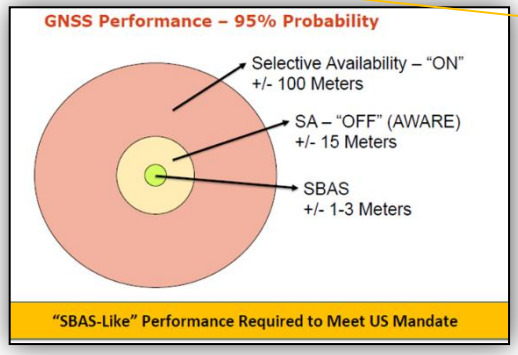
Towards SBAS for PinS and RNP0.3 in the whole Europe

EGNOS GSA ESSP NAVIGATION MADE IN EUROPE

Increasing FLEXIBILITY and complementing other technologies

20 European operators representing over 220 commercial aircraft interesting in ADS-B with EGNOS





Towards curved segments with SBAS

CS-ACNS Issue 2 – EGNOS used for geometric altitude for RNP-AR

Enhanced and Synthetic vision systems minima below 200ft & reduction of RVR

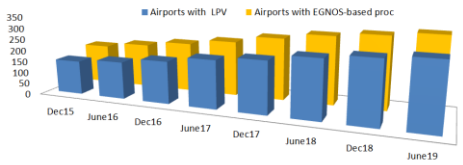
SBAS receivers (ETSO C145/146) present the maximum values of accuracy & availability

EGNOS GSA ESSP NAVIGATION MADE IN EUROPE

EGNOS at > 50% of the European airports with instrument runways

TODAY: 646 EGNOS procedures
@ 337 airports in Europe
AVAILABLE ONLINE on EGNOS PORTAL

By 2024
All IRE with EGNOS approaches



AVIATION GRANT PROGRAMME

New countries coming soon!

EGNOS Lithuania Project
First EGNOS implementation in Lithuania

ORO NAVIGACIJA

OMEGA+ Project
Nationwide implementation of EGNOS in Finland

AIRSPACE DESIGN

+ others

EGNOS

GSA

ESSP

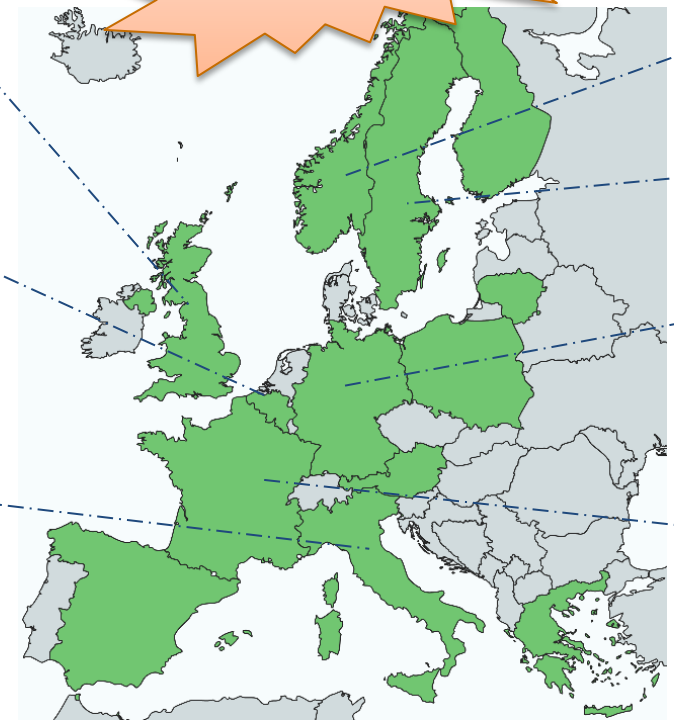
NAVIGATION MADE IN EUROPE

Pioneer operators using EGNOS

Almost 450 Operational aircraft in EU

New operators funded to get EGNOS on board and develop EGNOS capable avionics

Including ADS-B out



MUSTARROW LTD

1 x Cirrus SR20 G2

ASL AIRLINES BELGIUM

23 x Boeing 737-400
2 x Boeing 737-800

ENAV

2 x Piaggio P180 Avanti II

widerøe

9 x Bombardier Q400

OSM AVIATION ACADEMY

2 x Diamond 42 and 6 x Cessna 172R

JETCALL

2 x Learjet 45

ASL AIRLINES FRANCE

6 x Boeing 737-700

AVIATION GRANT PROGRAMME EGNOS

EGNOS

GSA

ESSP

NAVIGATION MADE IN EUROPE

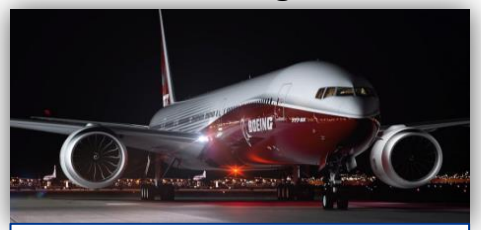
Boom of EGNOS solutions coming to the market

Airbus

Customer Option in A350
Available since EIS

Baseline in A220
48 units in service in EU;
83 orders
Under development
A319/20/21 (Q2 2020)
>1700 in-service in EU
à 5,700 NEO worldwide orders

Boeing



B777X
Customer option. Available by EIS (mid-2020)
325 orders

737MAX
Customer option (Q3 2020)
à 4,600 orders

Embraer

ERJ-135/140/145
Customer Option

E-170/175/190/195
Customer Option, STC developed

ATR 42, 72

-600 series
Customer Option, STC developed

Bombardier

Q series / CRJ
Customer Options

+ *STCs for Avro RJ85/100*
+ *STCs for Fokker 50*
+ *Baseline in most business jets: Cessna Citation, Dassault Falcon, Gulfstream G's, Bombardier Globals, Challengers…*

EGNOS GSA ESSP NAVIGATION MADE IN EUROPE

Snowball effect of EGNOS retrofit solutions thanks to Aviation Grant Programme of €22m

AVIATION GRANT PROGRAMME EGNOS

> 100EGNOS based procedures
> 100 EGNOS capable aircraft/rotorcraft

Aircraft type	GSA project	STC developer	Avionics	Estimated fleet size in Europe
DHC8-400	AirBaltic	CanardAerospace	UNS1-Ew	140
Saab340	NextJet	Scandinavian Avionics	UNS1-Ew	54
ATR42-500	HOP!	AeroConseil	CMC	19
Embraer E145	HOP!	N/A	UNS	23

flybe. Austrian LOT Olympic Airways Croatia Airlines widerøe Luxair brussels airlines

Loganair Scotland's Airline SprintAir Airest DOT LT TUS AIR Fleet Air Sky Taxi

CSA Czech Airlines DAT aurigny.com channel islands TAROM Romanian Air Transport

flybmi pan-europeenne air service Maleth-Aero Aero4M Eastern airways Loganair Scotland's Air

The current STC development might enable retrofit solutions for almost **240 aircraft* of more than 20 different operators**

+ Currently starting with additional projects from the 3rd Call e.g. STC/SB B737-400/700/800

*depending on cockpit configuration

EGNOS GSA ESSP NAVIGATION MADE IN EUROPE

From H2020 Research project to the first EU working group on GNSS for rotorcraft

5lives

PildoLabs

PildoLabs wessex

rega

inaer fly the future

ENAV

austro CONTROL

dgac

DSNA

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

ENAC

ANAC

LEONARDO

babcock trusted to deliver

rega

FLAG

Associate members
BABCOCK UK/PT/SP/IT/FR
AIR GREEN
NUCLEO ELICCOTTERI
SECURITE CIVILE
GENDARMERIE
ADAC LUFTRETTUNG
DAMTC
FLUGPOLIZEI
BRISTOW
CHC

AIRBUS HELICOPTERS

DRF Luftrettung

Growing community & changing way of flying

GSA

EUROCONTROL

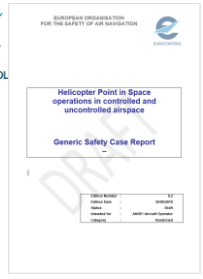
EASA European Aviation Safety Agency

+

AVIATION GRANT PROGRAMME EGNOS

2019 GOAL: WGs to produce materials supporting the rotorcraft implementations and regulatory process

EUROCONTROL



Contribution to ICAO, EASA (e.g. CS-ACNS Issue 2)

User requirements

Harmonizing EGNOS implementation for helicopters at European level

EGNOS

GSA

ESSP

NAVIGATION MADE IN EUROPE

EGNOS supports general aviation & IFR flying

General Aviation
6 Objectives we are committed

IFR Flying
Easier access of GA pilots to IFR rating, as a concrete measure that will improve safety.

Training
By end of 2018 the 3rd option for licensing will be fully developed providing a simple system for pilot training outside ATO.

Part-M 'Light'
Work towards a simpler and more proportionate framework for aircraft maintenance and license: a Part-M 'Light'.

Technology
Continue development of CS-STAN and other similar tools to enable the introduction of new technologies which contribute to safety.

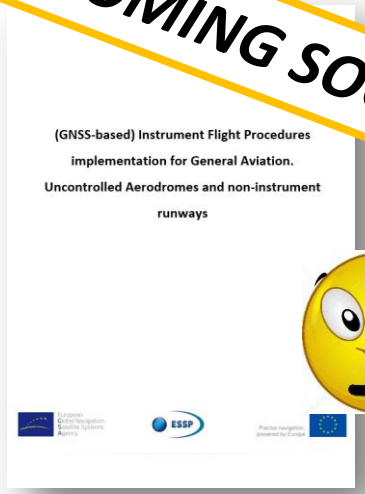
Simpler Certification
Towards a simpler framework for certifying LSA aircraft in the short term by increasing the support to applicants e.g. workshops , document templates etc. in the long term by amending applicable regulations in order to bring a radical simplification.

Industry standards
Build on the improvements of CS-23/Part-23 on other CS or regulations in order for EASA to focus on its safety objectives and to delegate the preparation of associated standards to industry groups (ASTM, ASD etc.)

EASA European Aviation Safety Agency

Big thanks to contributors!

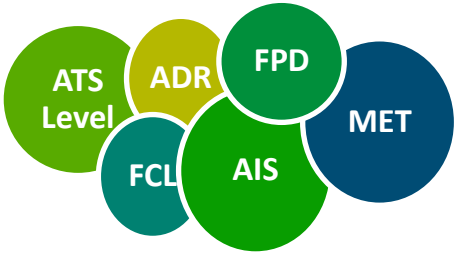
COMING SOON!



Safety Promotion Material
(ready, to be published 2019)

Just started!

GA GNSS WG



"Network of pilot implementations"

EGNOS

GSA

ESSP

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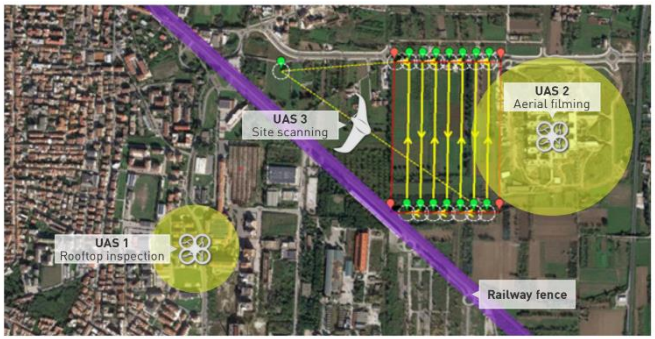
EGNOS entering in drones operations

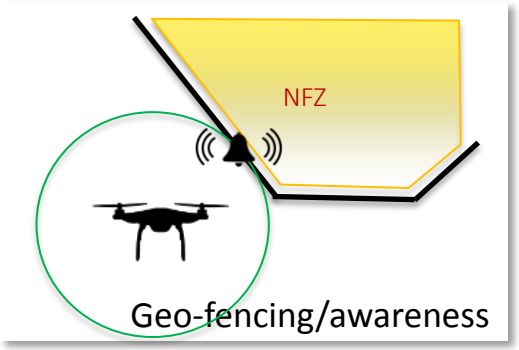
Enhanced performance in challenging environments

High accuracy for new demanding applications and drone separation



TOPVIEW LOOKING OVER

Increased accuracy and integrity for safe UAS operations



Eurocae WG 105 SG-62:
Guidelines on the use of Multi-GNSS for UAS

EUROCAE

EGNOS

GSA

ESSP

NAVIGATION MADE IN EUROPE

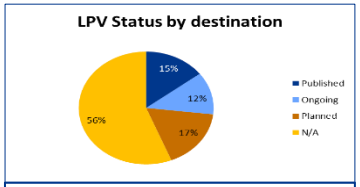
What else do we provide to users?

Training materials

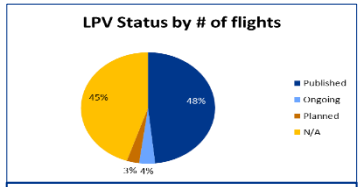
- *Compliant with the latest changes in Part-FCL*
- *Updated list of Learning Objectives of all GNSS and PBN*

Traffic assessments

- *39 airlines requested during 2018-2019!*

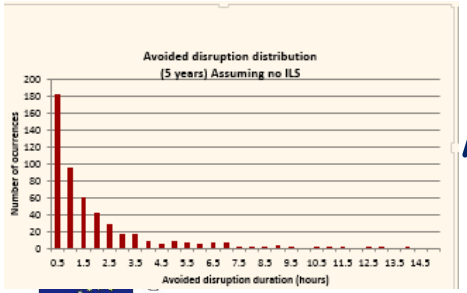


- 15% of destinations have at least x1 LPV procedure published
- An additional 29% of destinations will have at least x1 LPV procedure by 2020



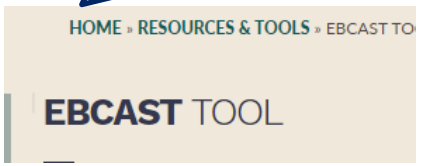
- 48% of flights at destinations with at least x1 LPV procedure published
- An additional 7% of flights at destinations that will have at least x1 LPV procedure by 2020

Cost Benefit Analysis



Offline
Customized

Online
- Including combined upgrades of LPV+ADS-B



EGNOS

ESSP

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Working with Aviation stakeholders to bring EGNSS to users & take their needs on board

EUROCONTROL

EASA
European Union Aviation Safety Agency

ESSP

SESAR
JOINT UNDERTAKING

SESAR
DEPLOYMENT MANAGER

EHA

canso

IAOPA

IATA

era
european regions airline association

EBAA

EGNOS

GSA

PPL/IR EUROPE

ESSP

NAVIGATION MADE IN EUROPE

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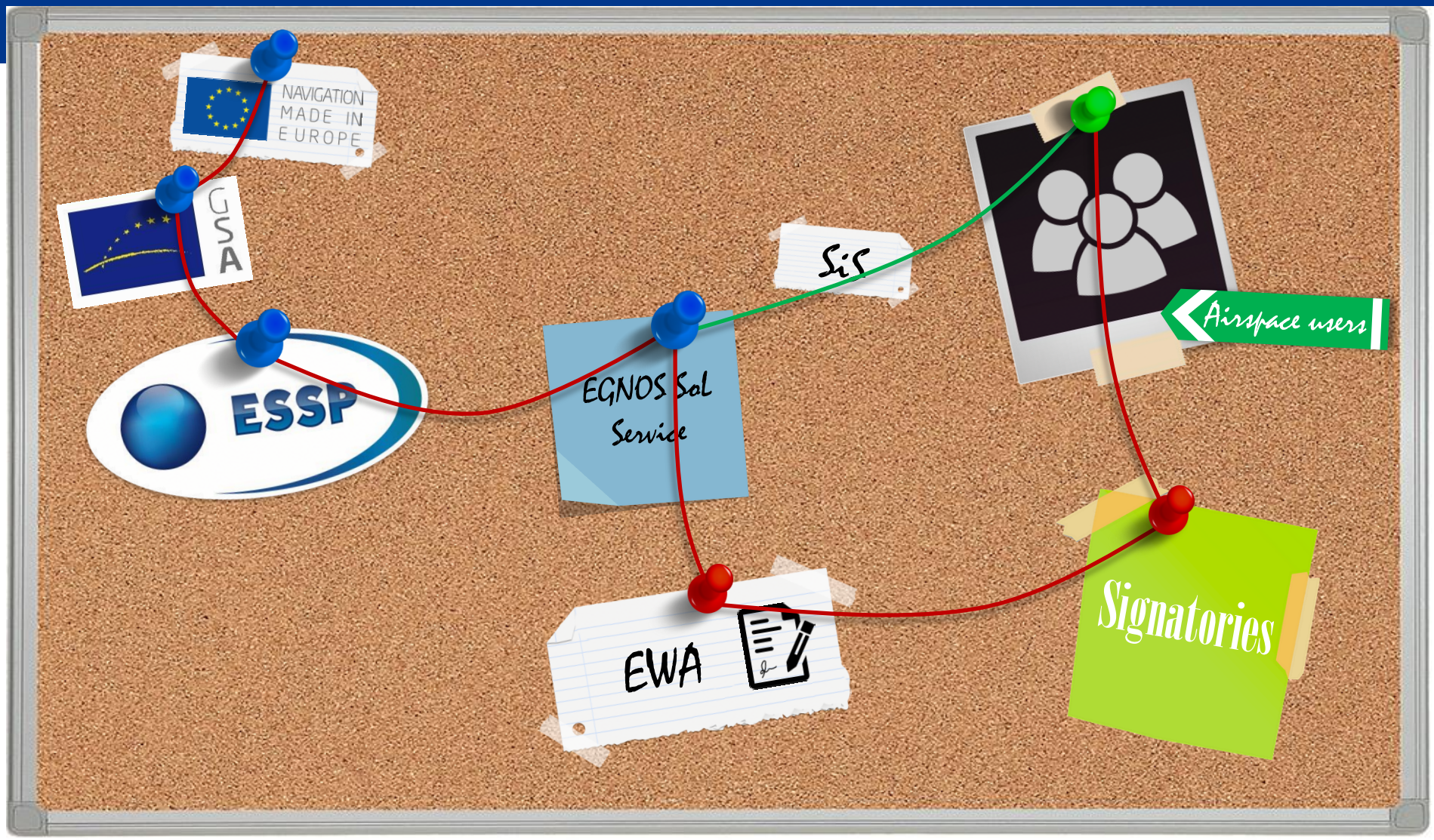
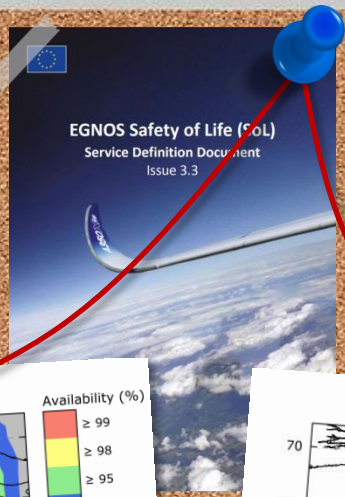
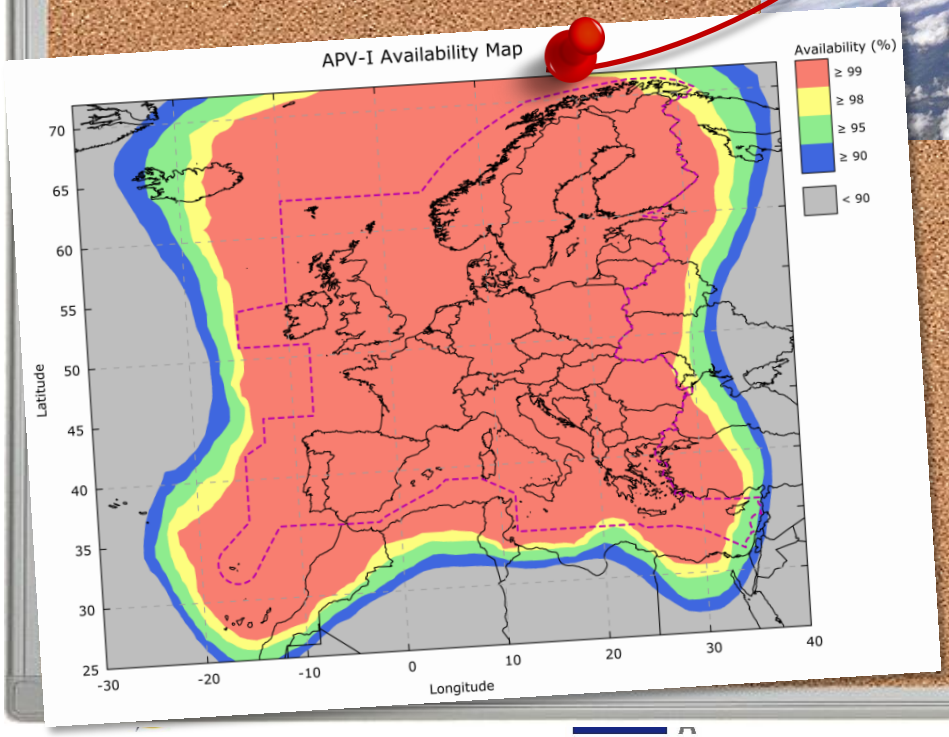
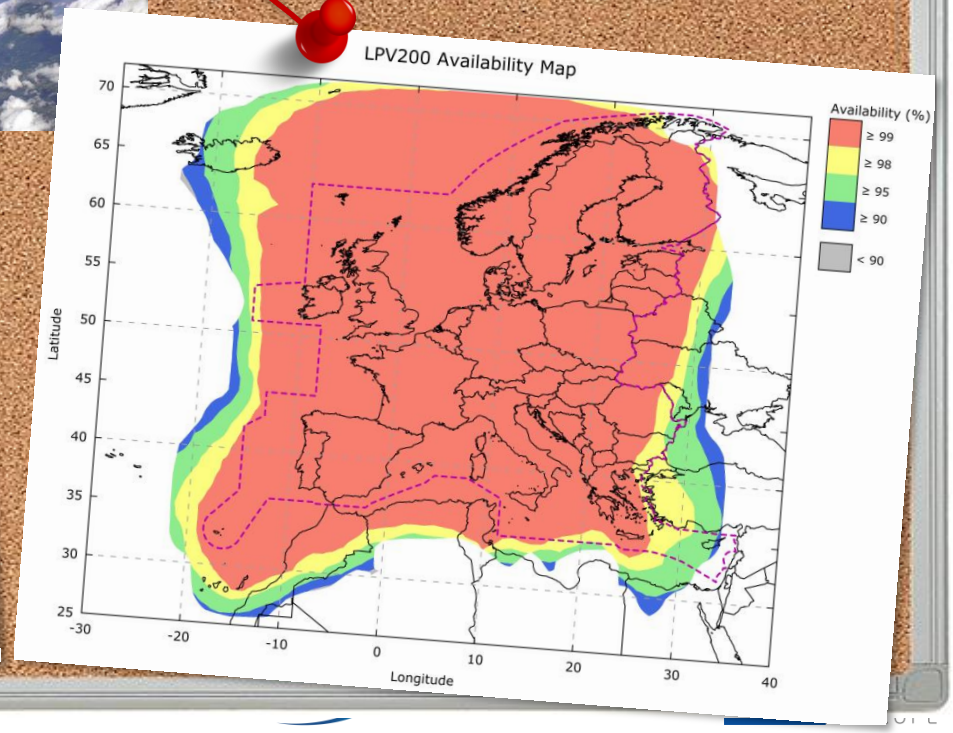


EGNOS Service Provision Scheme

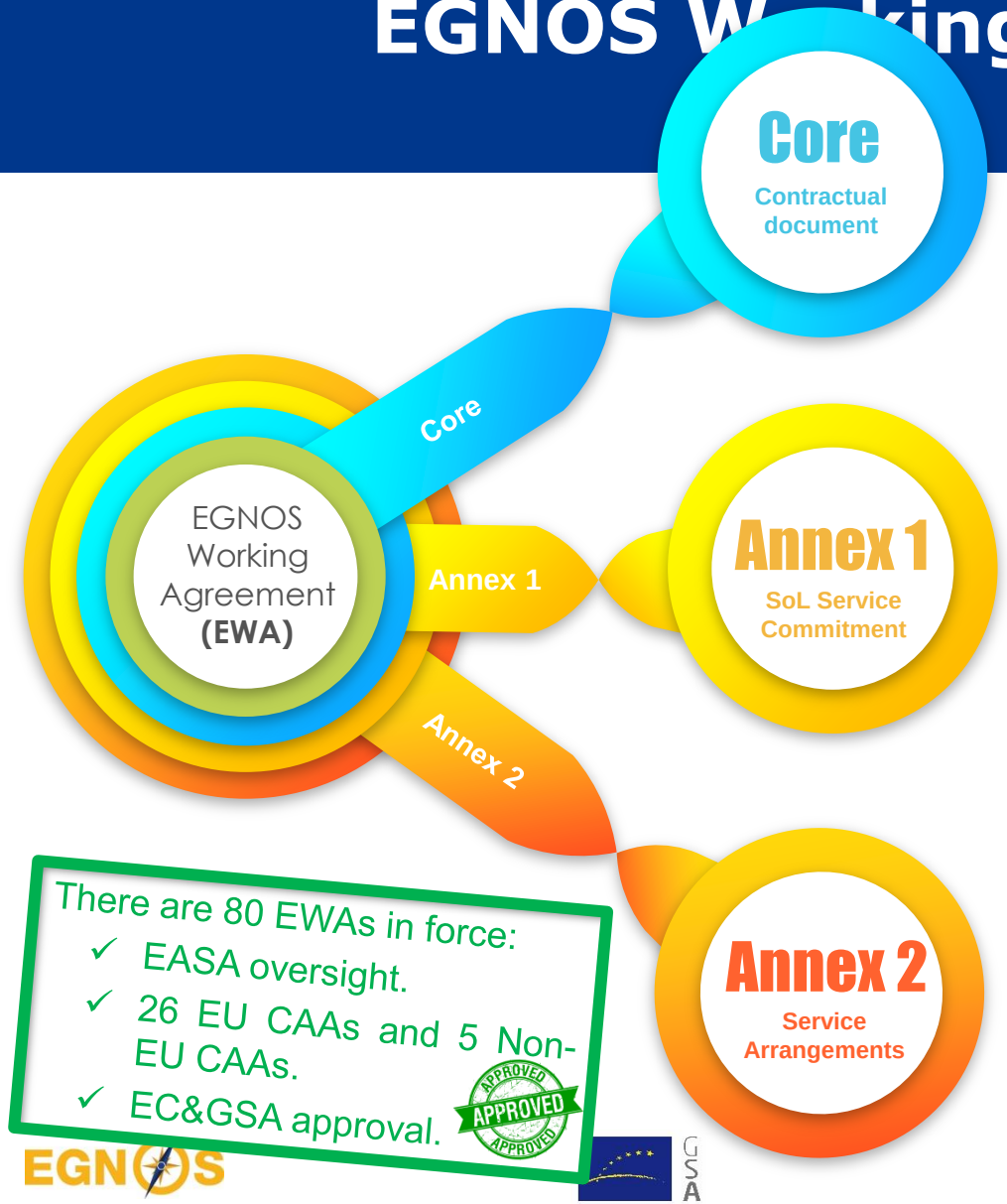






EWA Signatories

EGNOS W king Agreement



EWA core:

- Requested by Single European Sky (SES) Regulation.
- Contractual liability.

Annex 1:

- **SoL Service Definition Document (SDD):**
  Terms, conditions and characteristics of the Service.
- **Service Notices (SN):**
  Temporary amendments to the SoL SDD.
- **Contingency:**
  Covering non-compliances with the commitment maps included within the SoL SDD during a fixed time.

Annex 2:

- **NOTAM Proposal:**
  Terms and conditions under which ESSP provides the EGNOS NOTAM Proposal to the corresponding NOF.
- **Collaborative Decision Making (CDM):**
  Involvement of both the signatory & ESSP in the EGNOS use decision making process.
- **GNSS Data Recording:**
  Terms and conditions under which ESSP provides the GNSS data recorded for occurrence investigation.


There are 80 EWAs in force:
✓ 71 EWAs with EU ANSPs.
✓ 8 EWAs with Non-EU ANSPs.
✓ 1 EWA with Rotorcraft operator.
APPROVED
DFS
Guernsey
skyguide
DSNA
ENAIRE
Austro-Control
NATS
ENAV
HIAL
AVINOR FS
EDAL
PANSA
ANS-CR
NAV PT
LFV
ANS Finland
Wolver-hampton
Naviair
MADG
London Southend
LPS
Romatsa
Bulatsa
Jersey
Land's End
LVNL
skeyes
AVA a.s.
CCL
ACR
RNLAF
Biggin Hill Airport
RDAF
Hungaro-Control
IAA
AAA
Leonardo Helicopters
Saint Mary's
CODA
CAL
BAE Systems
Tallinn Airport Ltd
Brighton City Airport
Esbjerg Airport
Serco
Sonderborg Airport
Norwich Airport
MATS
HIAL
Waterford Airport
Donegal Airport
Sligo North West
Blackbushe Airport
Glouces-tershire
Aircraft Industries
HCAA
EANS
Mielec Airport
Hemavan Tarnaby
FerroNATS
Skövde Flygplats
Arvidsjaur Flygplats
Härjedalen Kommun
ISAVIA
SMATSA Montenegro
SMATSA Serbia
SAERCO
Torsby Airport
ESKM ATS
Lycksele Airport
Seinajoki Airport
Ireland West Airport
ANA
Trener
LGS
NLA
ATS Hagfors
High Coast Airport
Arendal Gullknapp
ORO Navigacija
2011
2012
2013
2014
2015
2016
2017
2018
2019

Non-EU States

- **EGNOS is directly usable in airspace of the EU territory**

- **EGNOS can be used at non-EU States providing that:**
  - There is enough coverage of the EGNOS SiS.
  - Safety Levels are equivalent to SES Regulation ones.

- **Process to be followed**
  1. The first step is always to enquiry EC/GSA/ESSP.

  2. An International Agreement (between EC and the non-EU State → to define the overall framework for the use of the EGNOS SoL Service.

  3. If agreed, then EWA (EGNOS Working Agreement with ESSP) → established on the basis of the previous agreement.

- **Liabilities and Financial aspects are key**

Non-ATS environments

B-ATS

Non-ATS environments

EASA
European Aviation Safety Agency

ATS
- ATC
- AFIS
- UNICOM
- NONE

COM
- A/G COM
- A/A Frequency

NAV
- PBN
- GNSS
- LPV minima

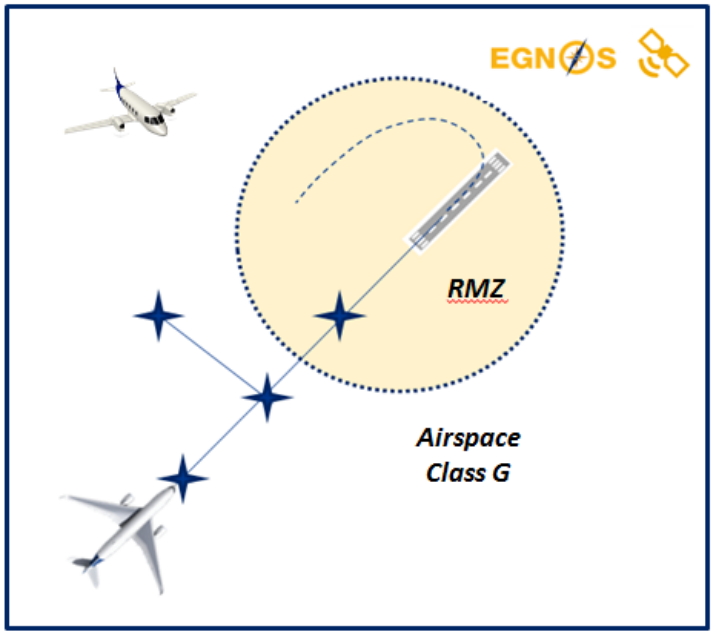
MET
- MET SP
- Auto MET
- AWOS/ASOS
- Near station

AIS
- AIS SP
  - AIP
  - NOTAM

ADR
- Non-IRE
- No RWY upgrade

Air
- RMZ
- CLASS G

FDP
- 3D
- 2D
- IFR

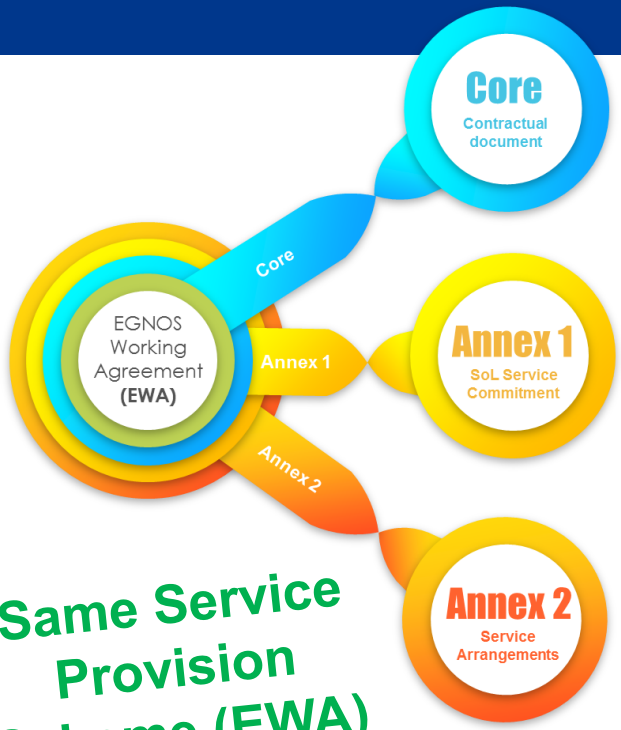


EQPT
- SBAS capable A/C
- ETSO 145-146

FCL
- BIR (M/DH + 200 ft)

EGNOS
GSA
ESSP
NAVIGATION MADE IN EUROPE

Non-ATS environments



Same Service Provision Scheme (EWA)

EWA Core:

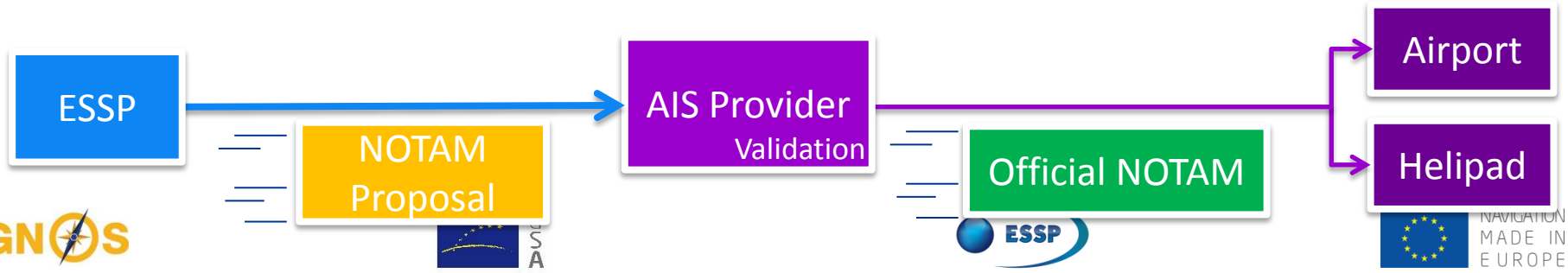
- Identified with → A licensed aerodrome
  → An AOC holder

Annex 1:

- SoL Service Definition Document (SDD).
- Service Notices (SN).
- Contingency.

Annex 2:

- Collaborative Decision Making (CDM).
- GNSS Data Recording.
- NOTAM Proposal:



Aviation Portal

Dashboard
- EGNOS System status
- Active and planned unavailability
- Services performance
- Airports availability information

Contractual doc.
EWA + Serv. Arr.

Manuals
- Airport Data Generation Tool
- Contingency

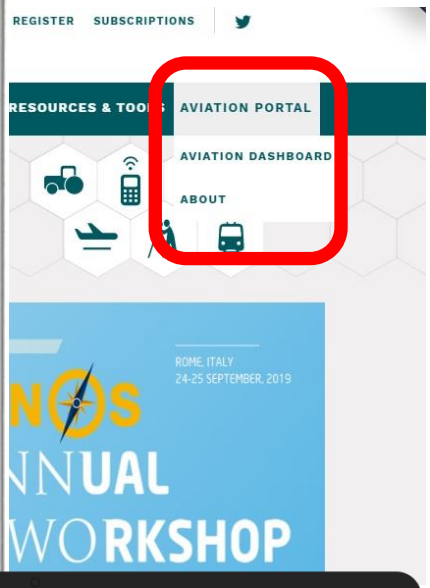
Airport Data Generation Tool
AIXM file generation

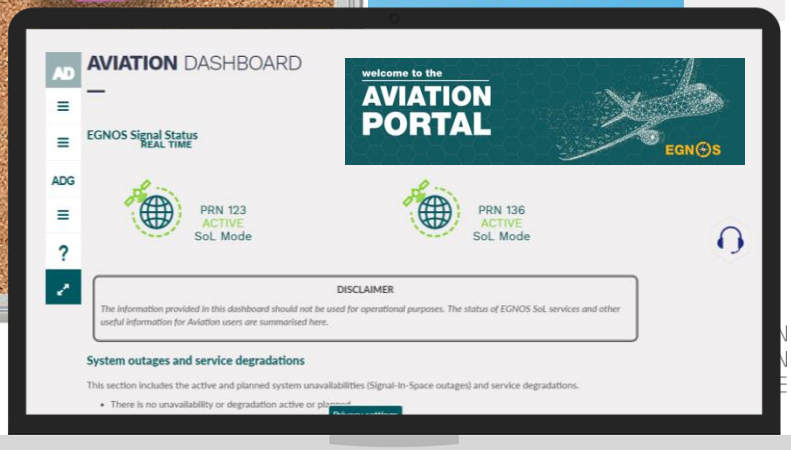
Contingency
Comm. repository

Points of Contact
- Information
- Modification request

Contact form

GNSS Data Recording Forms
- Access request
- Data request





EGNOS

Thanks your attention!