



GALILEO & EGNOS Programme Update

March 2017

EGNSS in the **SPACE STRATEGY** FOR EUROPE

- **Space Strategy** for Europe adopted in October 2016
- Four strategic goals:

**MAXIMISING THE BENEFITS OF SPACE FOR SOCIETY AND
THE EU ECONOMY**

**FOSTERING A GLOBALLY COMPETITIVE AND INNOVATIVE
EUROPEAN SPACE SECTOR**

**REINFORCING EUROPE'S AUTONOMY IN ACCESSING AND
USING SPACE IN A SECURE AND SAFE ENVIRONMENT**

**STRENGTHENING EUROPE'S ROLE AS A GLOBAL ACTOR AND
PROMOTING INTERNATIONAL COOPERATION**

PROGRAMME PRIORITIES



Deploying the infrastructure





Providing services as they come on stream

Establishing Galileo & EGNOS in the market


Preparing for the future



THE SERVICES

Open Service (OS)	Freely accessible service for positioning, navigation and timing	
Public Regulated Service (PRS)	Encrypted service designed for greater robustness and higher availability	
Search and Rescue Service (SAR)	Assists locating people in distress and confirms that help is on the way	
Commercial Service (CS)	Delivers authentication and high accuracy services for commercial applications	

The former "Safety-of-Life" service is being re-profiled:

Integrity Monitoring Service	Provides vital integrity information for life-critical applications	
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GALILEO IMPLEMENTATION: A STEP-WISE APPROACH

By 2020 Galileo will be:

- fully deployed
- adopted by the widest user communities
- a civilian infrastructure delivering robust positioning and timing services with high degree of performances

Galileo System Testbed v1
Validation of critical algorithms

2003

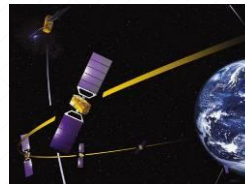


GIOVE A/B
2 test satellites
2005/2008



In-Orbit Validation
4 operational satellites and ground segment

2013



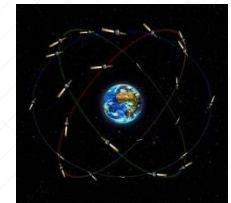
Initial Services Provision
Initial services for OS, SAR, PRS,
and demonstrator for CS

2016



Full Operational Capability
Full services, 30 satellites

2020



GALILEO SPACE SEGMENT

FIRST FOUR SATELLITES (IOV)
LAUNCHED IN 2011 AND 2012

SATELLITE 5 & 6 RECOVERED
AND ON IMPROVED ORBITS

SATELLITE 7 & 8 LAUNCHED
ON 27 MARCH 2015

SATELLITE 9 & 10 LAUNCHED
ON 11 SEPTEMBER 2015

SATELLITE 11 & 12 LAUNCHED
ON 19 DECEMBER 2015

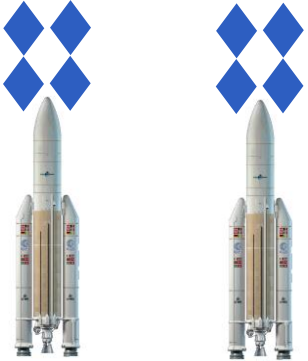
SATELLITE 13 & 14 LAUNCHED ON
24 MAY 2016

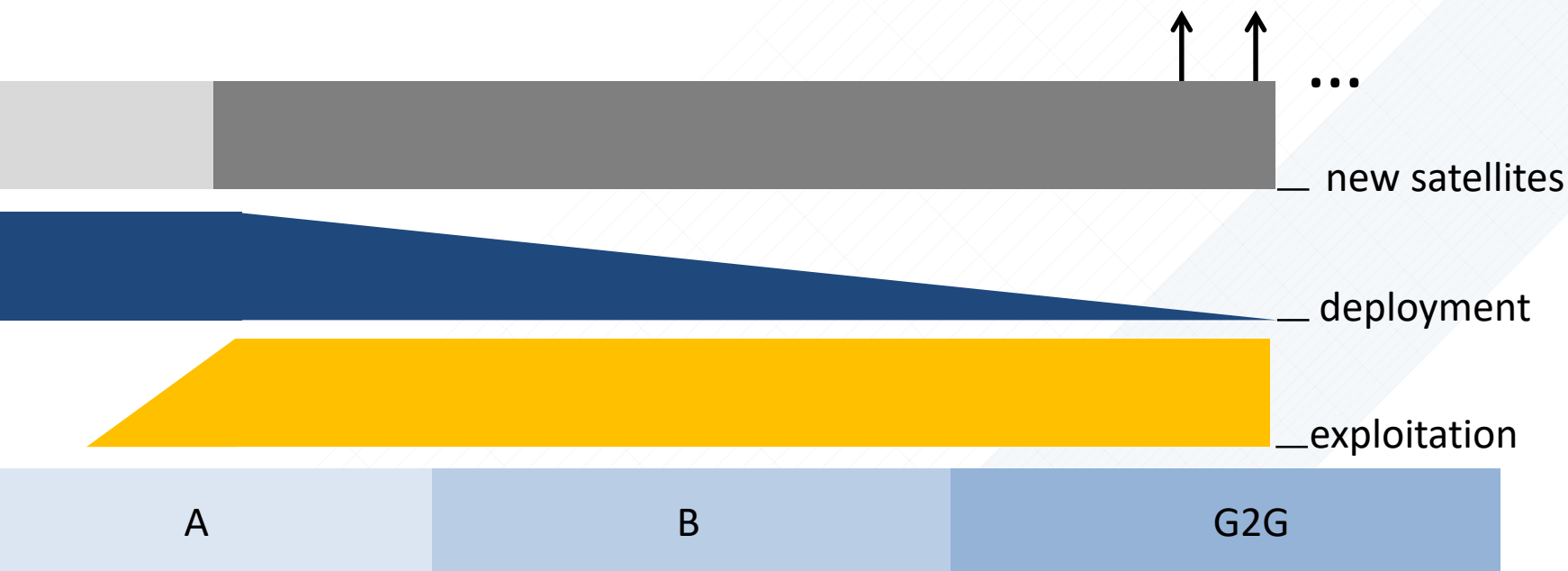
SATELLITES, 15-18 launched
November 2016

30 SATELLITES IN ORBIT BY 2020



GALILEO NEXT STEPS

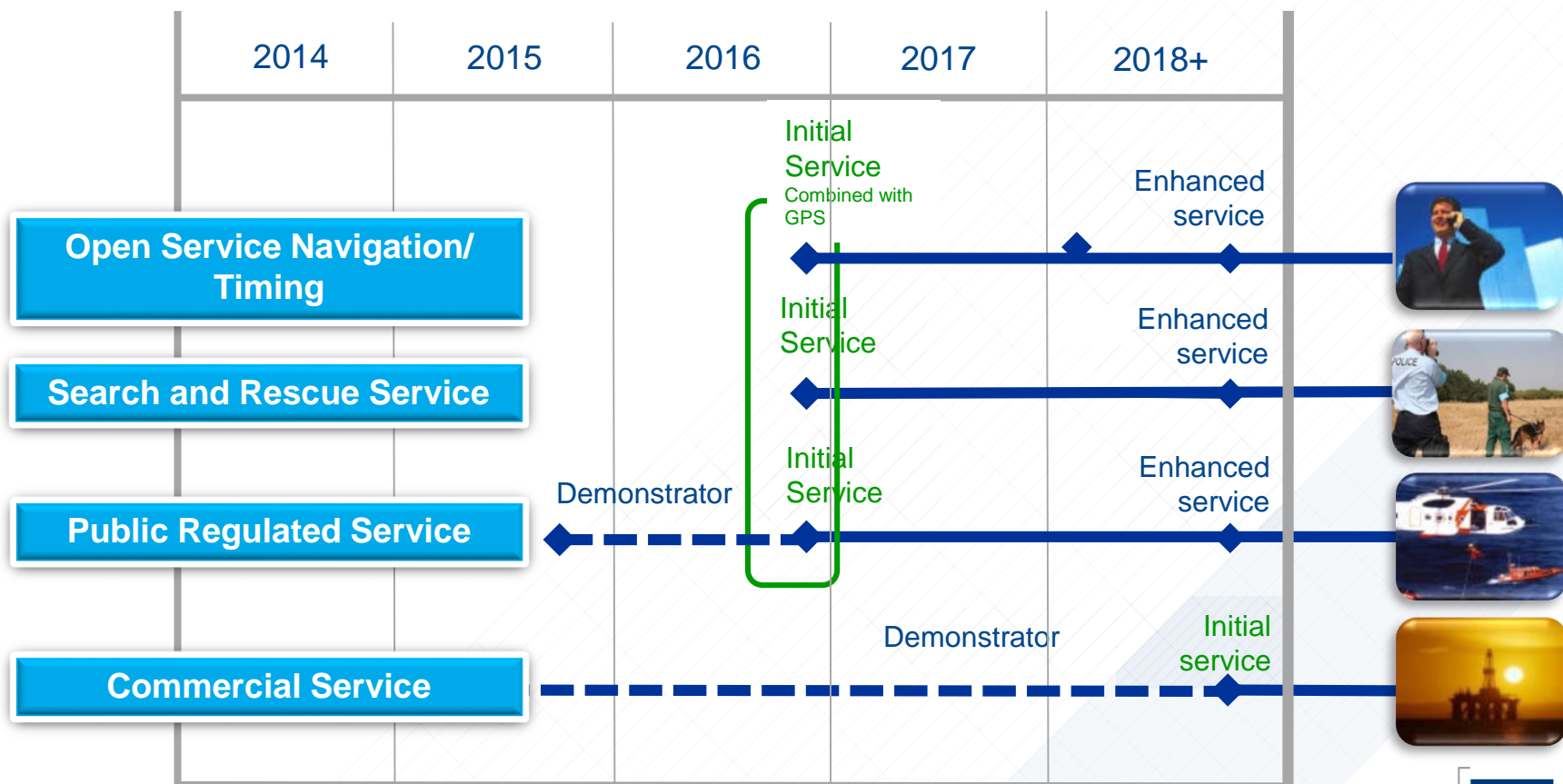
2017	2018	2019	2020	2021
 19-22 23-26				



GALILEO INITIAL SERVICES declared on 15 Dec 2016



GALILEO INITIAL SERVICES declared on 15 Dec 2016



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GALILEO INITIAL SERVICES PERFORMANCE LEVELS

OS Navigation

Good ranging signals
($< 2\text{ m}$ 95%,
 $< 87\%$ availability)

Excellent timing performance
($< 30\text{ ns}$ 95%,
 $< 87\%$ availability)

SAR Forward Link

Contribution to COSPAS/SARSAT with
* **shorter detection times (10min)**
* **better localization accuracy**

PRS Access

Good ranging signals

GALILEO REFERENCE DOCUMENTATION



Galileo Initial Service - Open Service - Service Definition Document

Version 1.0 published in Dec 2016



Galileo Initial Service - Search And Rescue - Service Definition Document

Version 1.0 published in Dec 2016



Galileo Open Service Signal In Space Interface Control Document (OS SIS ICD)

Version 1.3 published in Dec 2016



Galileo NeQuick Ionospheric Model

Version 1.2 published in Sept 2016



<https://www.gsc-europa.eu/electronic-library/programme-reference-documents>

COMMERCIAL SERVICE

- Decision of 8 February 2017 defines the Technical and Operational Specifications of the Commercial Service

eur-lex.europa.eu



L 34/36

EN

Official Journal of the European Union

9.2.2017

COMMISSION IMPLEMENTING DECISION (EU) 2017/224

of 8 February 2017

setting out the technical and operational specifications allowing the commercial service offered by the system established under the Galileo programme to fulfil the function referred to in Article 2(4)(c) of Regulation (EU) No 1285/2013 of the European Parliament and of the Council

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) No 1285/2013 of the European Parliament and of the Council of 11 December 2013 on the implementation and exploitation of European satellite navigation systems and repealing Council Regulation (EC) No 876/2002 and Regulation (EC) No 683/2008 of the European Parliament and of the Council ⁽¹⁾, and in particular Article 12(3)(d) thereof,

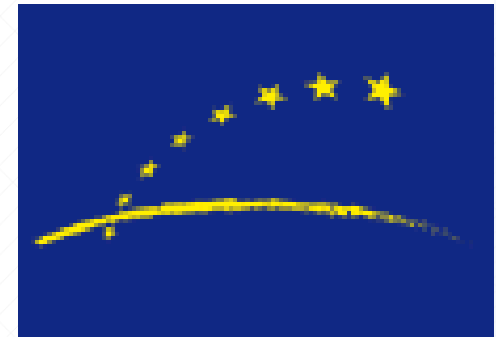
and

13



GALILEO SERVICE PROVISION

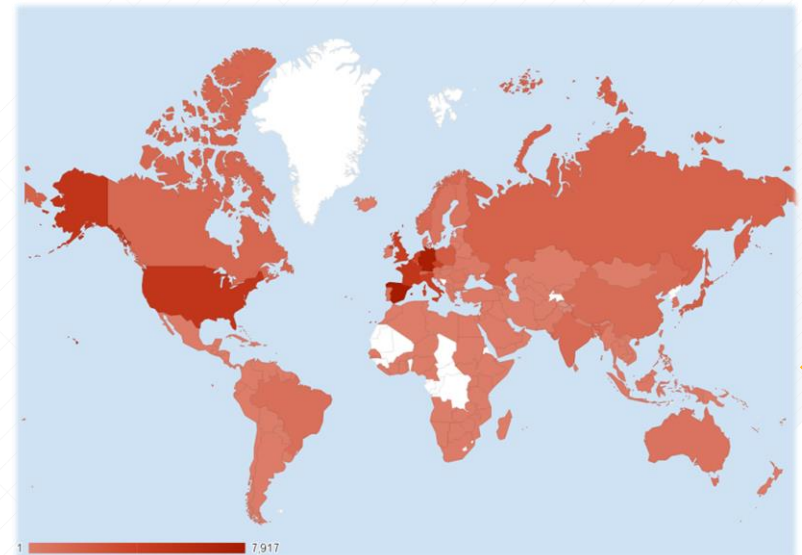
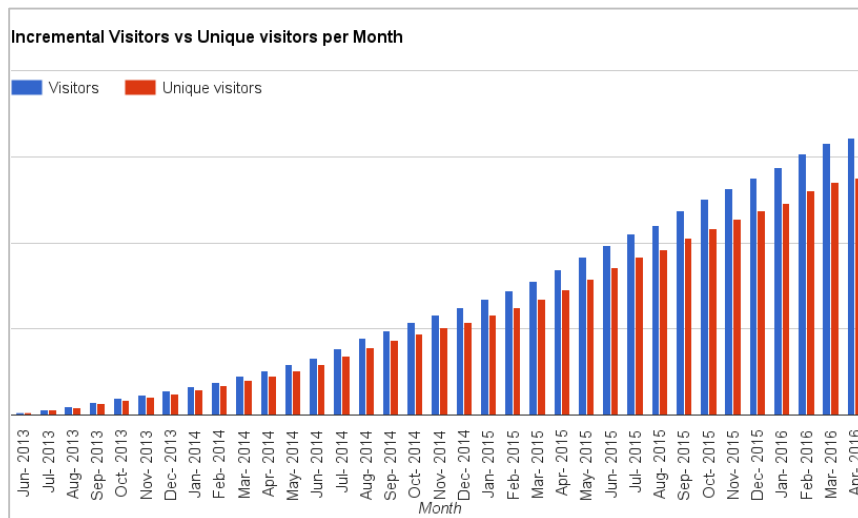
- Hand Over of exploitation phase to the **European GNSS Agency (GSA)**
- Selection of the **Galileo Service Operator (GSOp)**
 - Contract signature December 2016
 - Handover of operations by mid 2017
- New **GNSS Service Center** building in Madrid
 - One-stop shop for Galileo customers
- New **Galileo Reference Center** in Noordwijk
 - Independent monitoring of Galileo performance based on EU Member States infrastructure and competences



GALILEO SERVICE CENTRE **FOR USERS**

Some GSC figures (from 1st Jun 2013 to 15th April 2016):

- More than **71k visits** from **181 different countries!**






- **143 user requests** handled and **91 advisory notices (NAGU)** published
- **383 registered users** on the GSC web portal

R&D MISSION AND SYSTEM

- **MISSION:** concept studies for new types of mission and services
 - ⇒ H2020 budget, managed by EC
 - ⇒ Envelope for [2015-2017] period: ~15 M€
- **INFRASTRUCTURE:** technological studies for infrastructure evolution
 - ⇒ H2020 budget, delegated to ESA
 - ⇒ Envelope for [2015-2017] is ~ 150 M€.



THE SERVICES

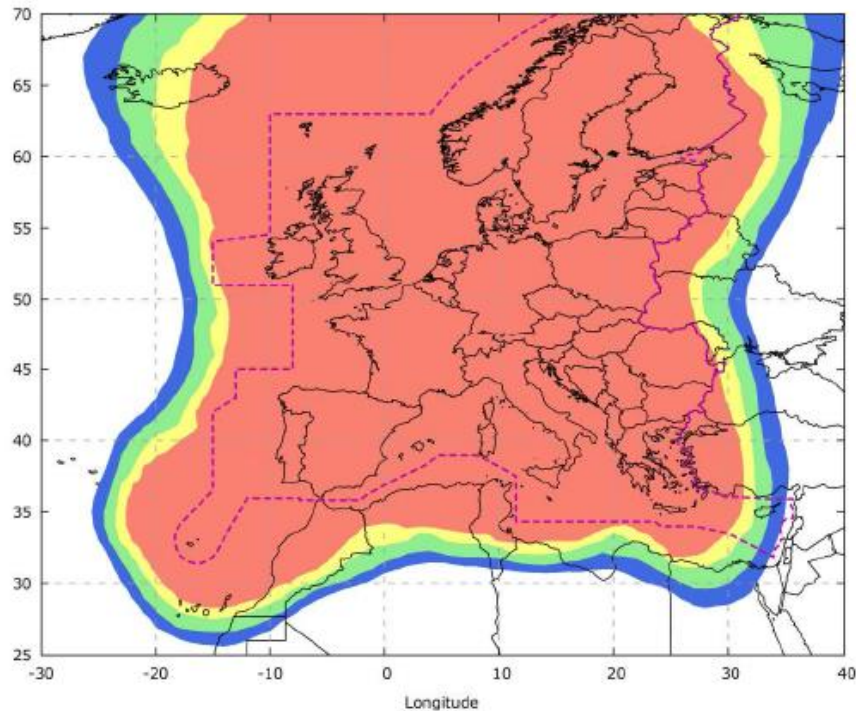
Open Service (OS)	Accuracy ~1m, free	Available since October 2009	
Safety of Life Service (SoL)	Accuracy ~1m, compliant to aviation standards	Available since March 2011	
EGNOS Data Access Service (EDAS)	Accuracy <1m, corrections provided by terrestrial networks	Available since July 2012	

CURRENT EGNOS **SYSTEM STATUS**

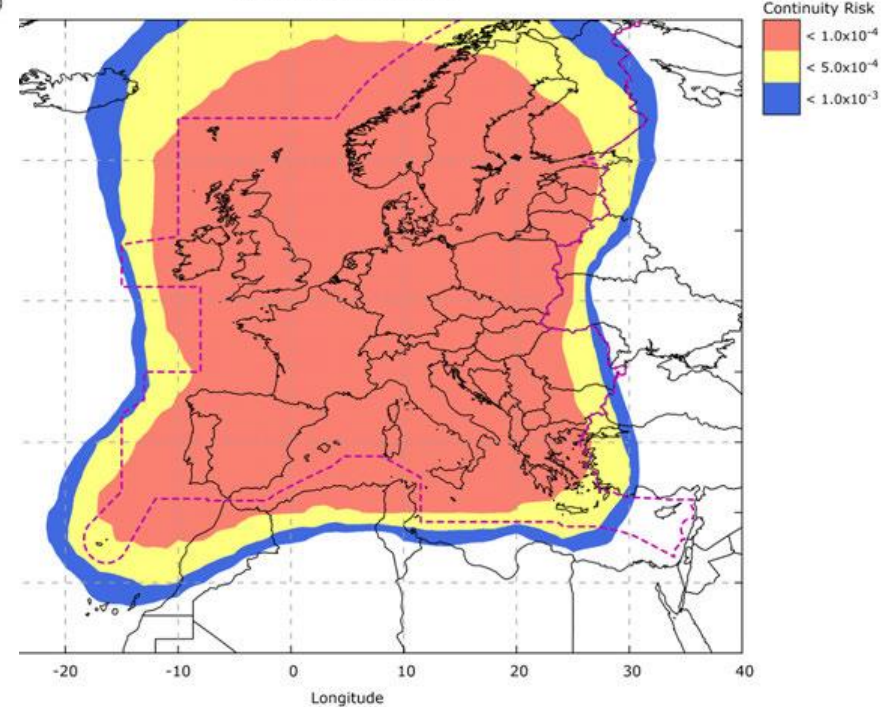
- Current EGNOS Release: **ESR 2.4.1M** (since August 2015)
- 2 Operational GEOs:
 - Inmarsat 3F2 (PRN-120)
 - SES-5 (PRN-136)
- 1 GEO in Test/Back-up: Inmarsat 4F2 (PRN-126) – moved to 63,9°E
- Better performance
- 39 RIMS (Ranging and Integrity Monitoring Stations)
- And, LPV-200

EGNOS SAFETY OF LIFE PERFORMANCE (SoL SDD): APV-I

APV-I Availability Map



APV-I Continuity Map



- Historical data on airports with EGNOS procedures:
 - Availability $> 99.8\%$ (except EFJO – FI with 99.69%)
 - Continuity $< 1e-5$ (except 3 airports– FI & NO $< 1e-4$)

412 EGNOS based procedures in 20 countries as of January 2017

Country	LPV procedures	LPV200 procedures	Baro procedures
Austria	2		
Belgium	5		
Croatia	1		
Czech Republic	8		4
Denmark	8		
Finland	2		
France	145	11	5
Germany	37		63
Guernsey	2		
Hungary		4	
Italy	17		
Netherlands	3		2
Norway	22	4	16
Poland	9		
Portugal	2		
Romania	2		
Slovak Rep.	4		
Spain	2		
Sweden	3		
Switzerland	10	1	
United Kingdom	18		
Total	302	20	90

322 operational LPV/LPV200/PinS
+ 90 additional 'EGNOS Enabled' APV-Baro



EGNOS SERVICES FURTHER **IMPROVE OVER TIME**

2015/2016

- Publication of the Service Definition Document for SoL LPV200 service level, September 2015
- EGNOS New Generation Decision taken with aviation and maritime baseline

Medium term

- EGNOS version 3 with dual (L1/L5) frequencies, also to enable augmentation of Galileo, procurement in 2016, kick-off in 2017
- Full coverage of 28 EU Member States' territory (geographically located in Europe)

Long term

- Subject to conclusion of necessary contracts and agreements, extension of the EGNOS coverage to EU neighbouring countries and regions, including Africa.

APPLICATIONS



REGULATED APPLICATIONS

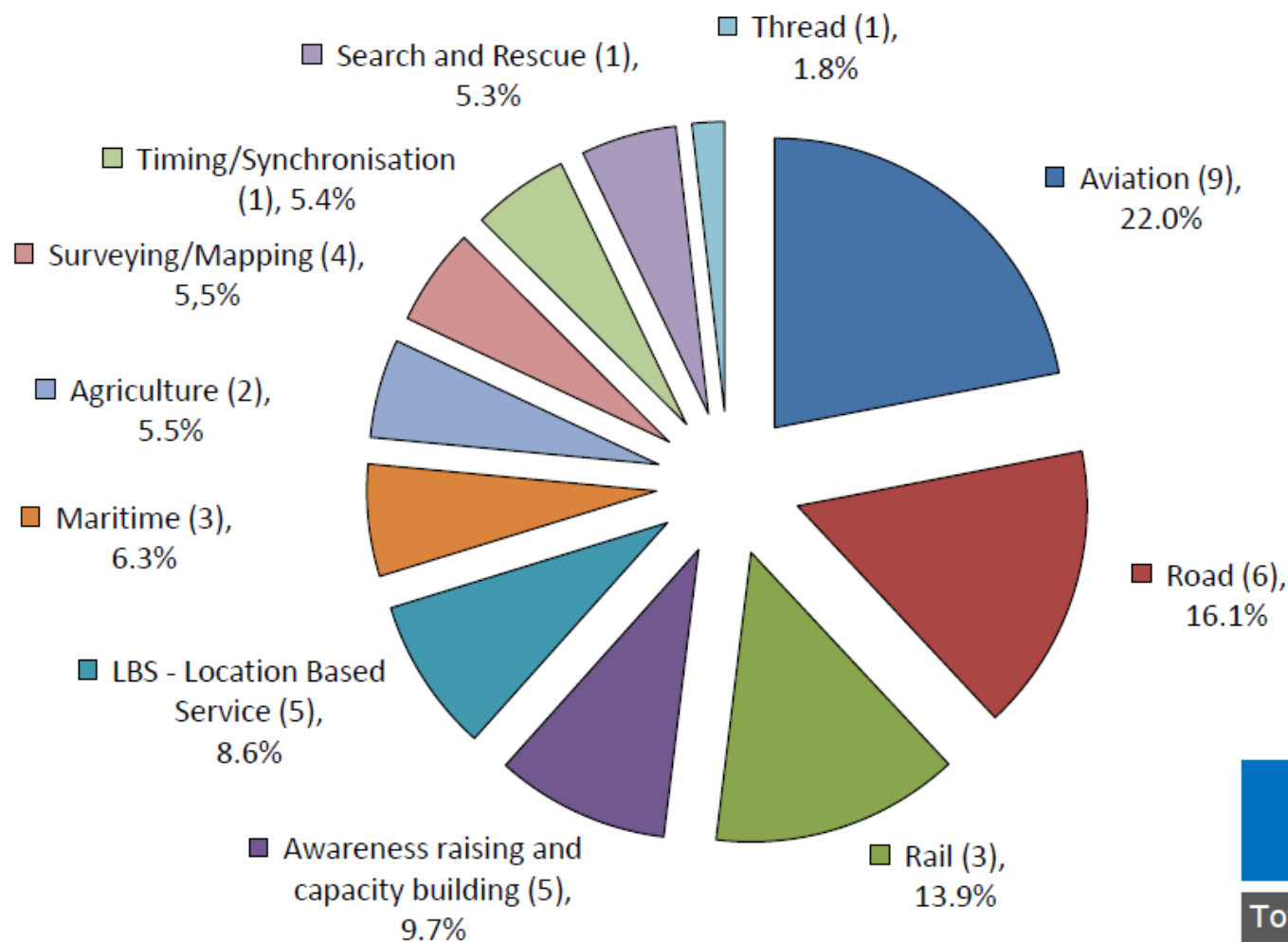
- **Digital Tachograph**
 - Adopted in March 2016
 - Foresees use of Galileo and EGNOS
 - Same wording as in eCall
- **World Wide Radio Navigation System**
 - Recognition of Galileo as WWRNS
 - Maritime and Safety Committee - May 2016
- **Use of Galileo in Critical Infrastructures**
 - Under analysis for timing and synchronisation
- **Use of EGNOS and Galileo to improve safety and performance in automated driving**
 - Amsterdam Declaration on Connected & Automated Driving - April 2016



HORIZON 2020 – APPLICATIONS

Funded projects distributed by market segment

(number of projects), %EU contribution



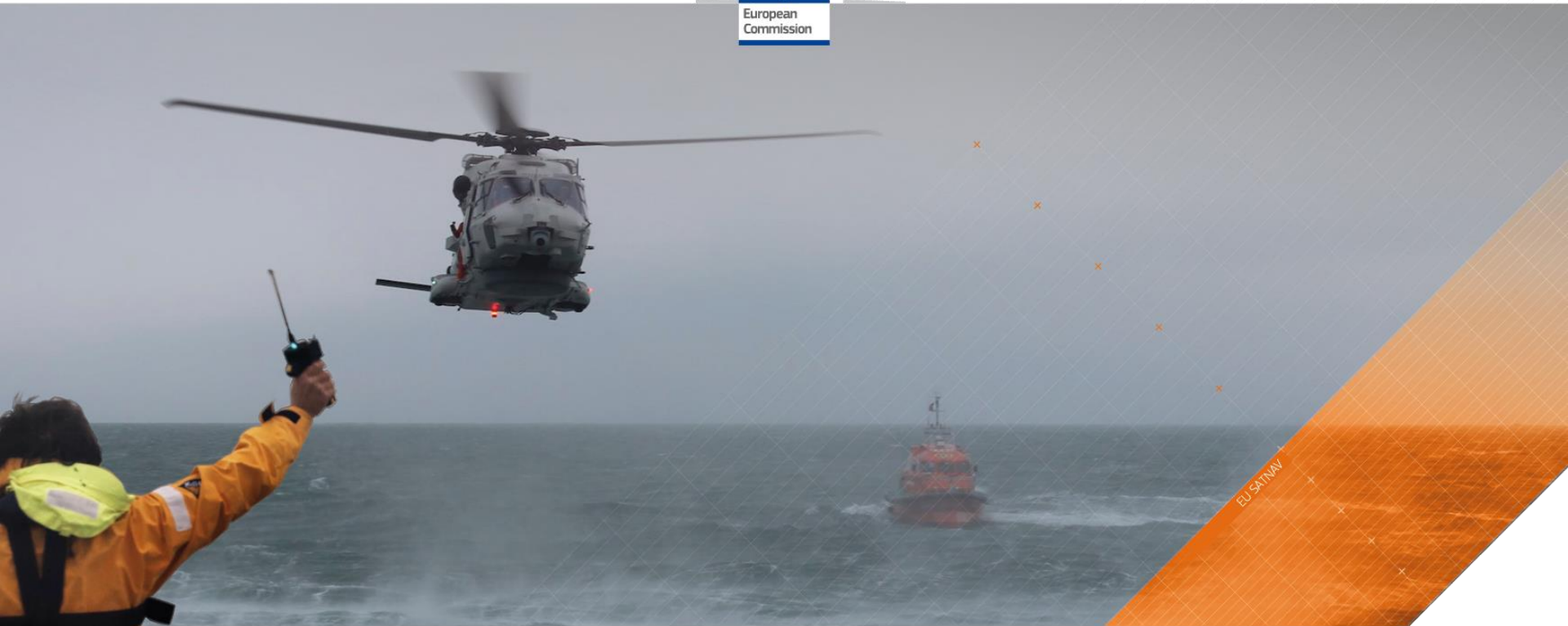
EGNSS applications
Calls for proposals
Galileo 2014-2015

Total EU
contribution (M€):

65.1

HORIZON 2020 – APPLICATIONS

- Call for proposals in 2017
 - Galileo 1 – 2017 – European GNSS Transport Applications (addressing all modes of transport);
 - Galileo 2 – 2017 – European GNSS Mass Market Applications (addressing smart cities, internet of things and commercial and social LBS;
 - Galileo 3 – 2017 – European GNSS Professional Applications (addressing agriculture, surveying timing and synchronisation etc);
 - Galileo 4 – 2017 – European GNSS Awareness raising and capacity building
- Call budget is € 33 million



THANK YOU

<http://ec.europa.eu/growth/sectors/space/galileo/>