



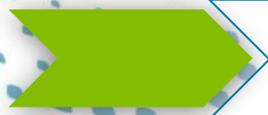
Airbus Fleet Readiness for SBAS/LPV

Regional workshop on AFI GNSS/SBAS

05th March 2021

Mathieu HIALE-GUILHAMOU
Engineering - Navigation specialist

AIRBUS



Introduction

SBAS

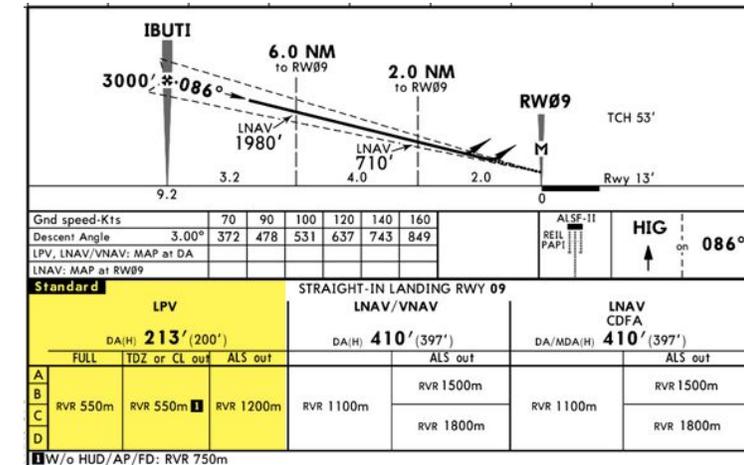
LPV approaches with SLS

Introduction

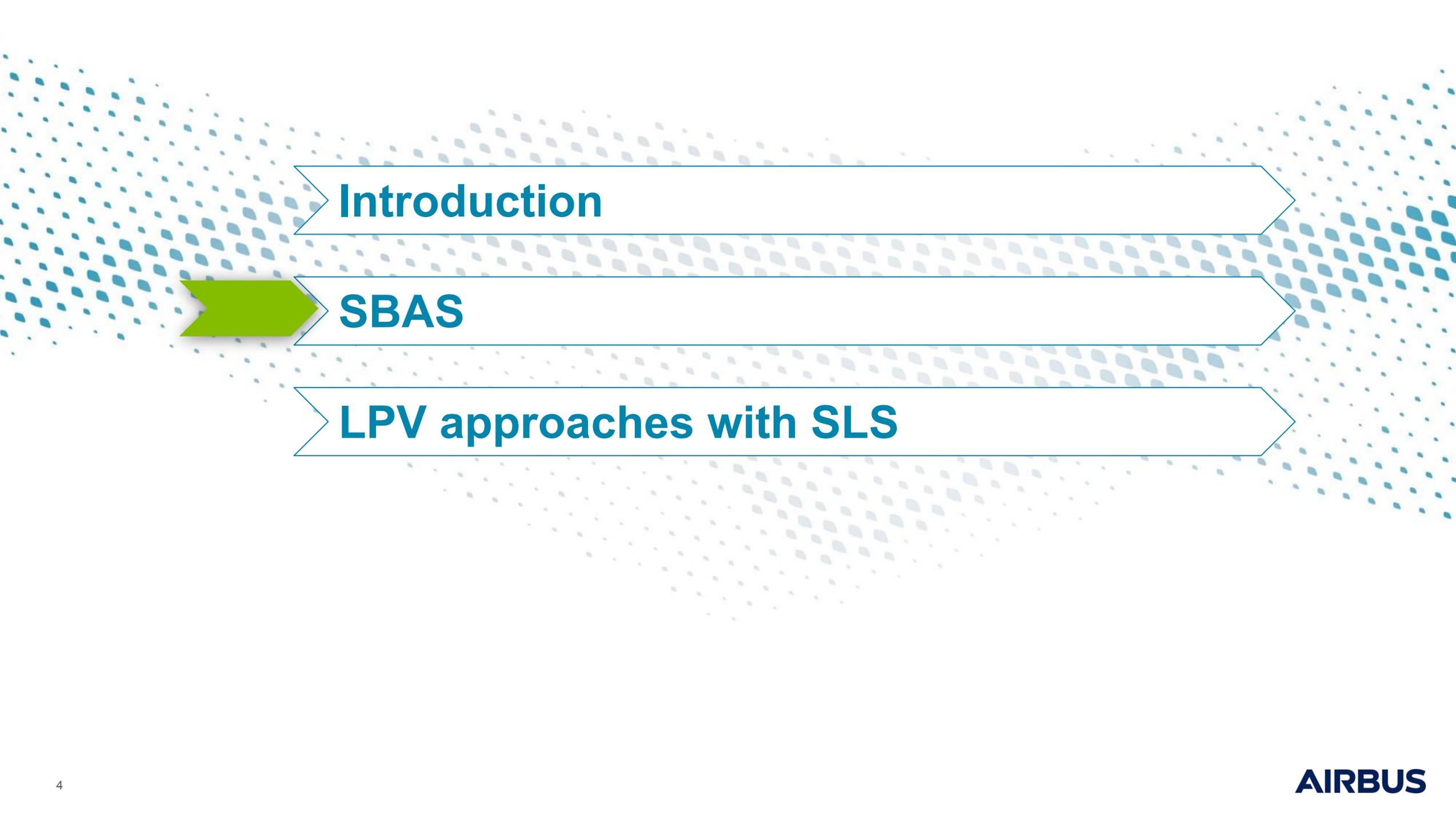
- SBAS technology is a **KEY ENABLER** technology for airborne functions
 - **ADS-B** where required (US Mandate)



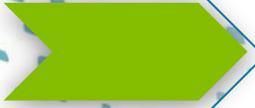
- **LPV approaches**
SBAS Landing System (SLS)



- SBAS requires a new generation of **MULTI-MODE RECEIVERS (MMR)**



Introduction



SBAS

LPV approaches with SLS

SBAS

Why new Multi-Mode Receivers?

To address **major hardware obsolescence** affecting all Airbus families



To support today and future approaches

- SLS / LPV
- GBAS CAT II/III

To provide **SBAS capability** required by mandates

SBAS

Review of A320 family / A330 family MMRs



	GLU-925	iMMR	GLU-2100
GPS (SA Aware)	✓	✓	✓
SBAS NAV	✗	✓	✓
SLS/LPV	✗	✓	✓
GLS Cat I	✓	✓	✓
GLS Cat II/III prov	✗	✓	✓
FLS	✓	✓	✓

SBAS

Review of A380 A350 MMRs



A380

GLU-925

GLU-2100

GPS (SA Aware)	✓	✓
SBAS NAV	✗	✓
SLS/LPV	✗	✓
GLS Cat I	✓	✓
GLS Cat II/III prov	✗	✓
FLS	✓	✓

Target Availability
2021



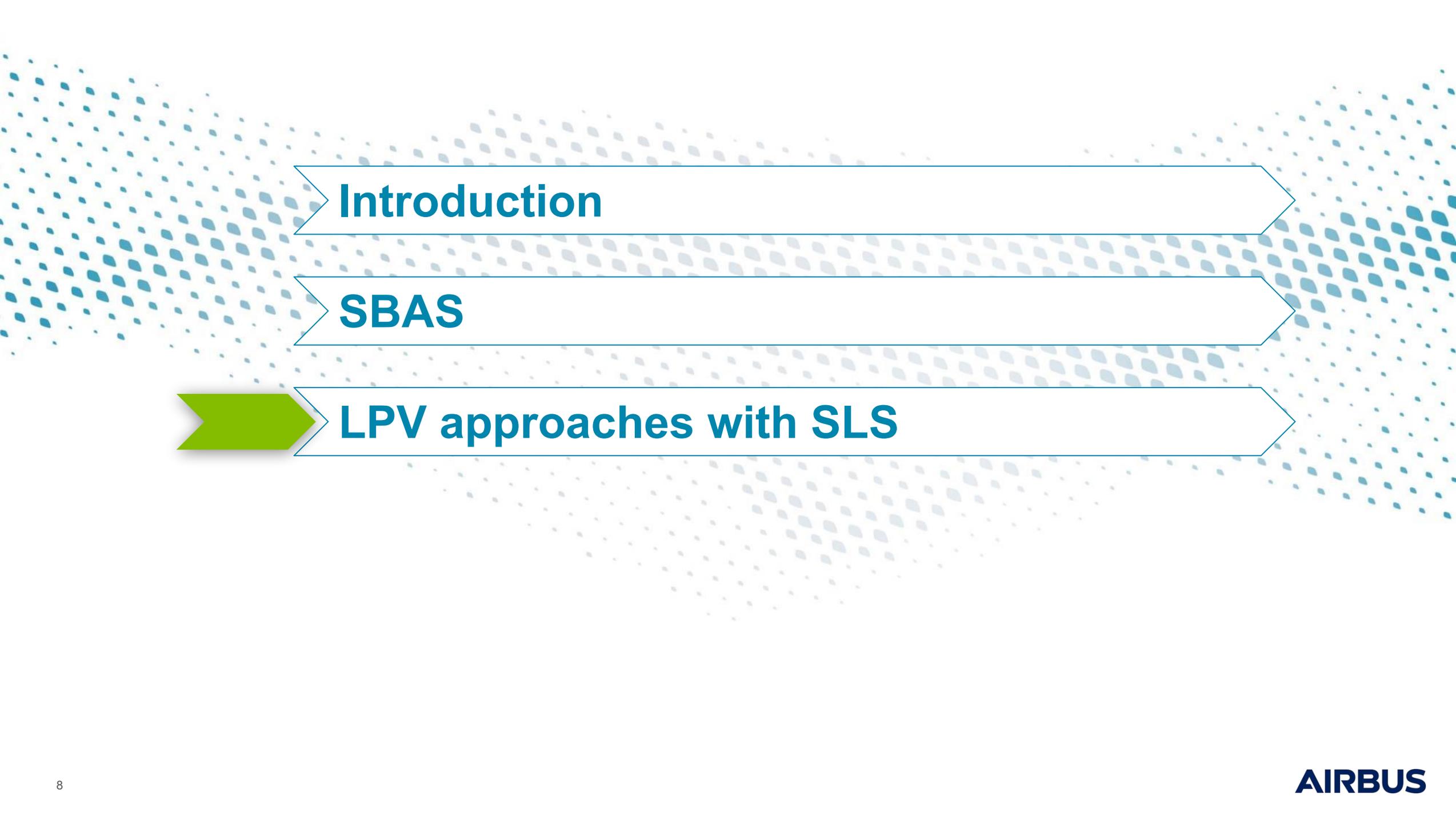
A350

GLU-925

GLU-2100

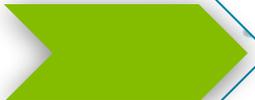
GPS (SA Aware)	✓	✓
SBAS NAV <small>Since Entry Into Service</small>	✓	✓
SLS/LPV	✓	✓
GLS Cat I	✓	✓
GLS Cat II/III prov	✗	✓
FLS	✓	✓

Target Availability
Target 2021



Introduction

SBAS

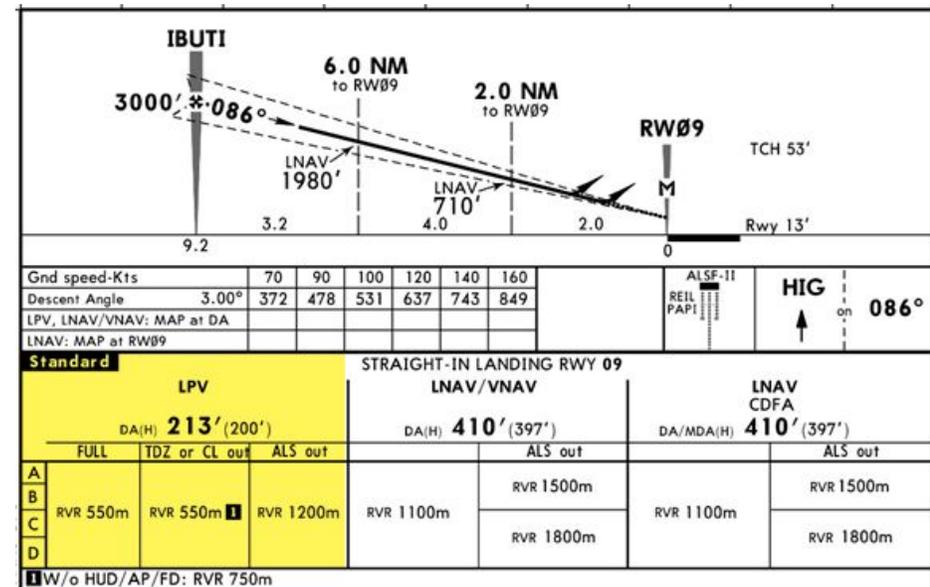


LPV approaches with SLS

Introduction

What is SBAS Landing System (SLS)

- Thanks to this technology based on differential GPS, it is possible to fly **RNAV (GNSS) approaches** in an **ILS look-alike** way:
 - With **geometric vertical guidance**
(no issue with QNH setting error and baro VNAV in cold temperature)
 - With **LPV minima**
(performance equivalent CAT I ILS: down to 200 ft)
 - **Pilot Training** limited to **level A**



Introduction

What is SBAS Landing System (SLS) - Comparison with RNP-AR

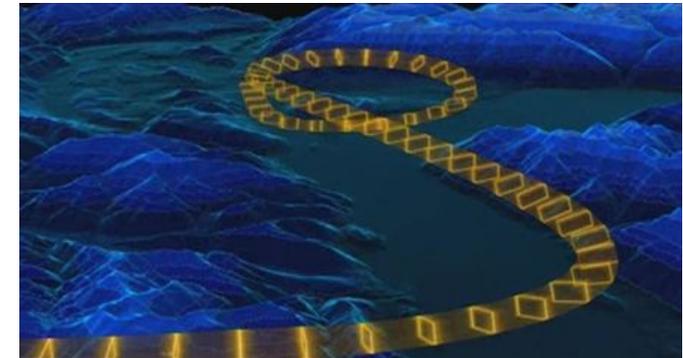
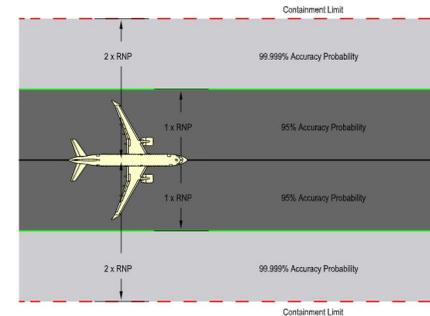
- **LPV is for Straight-in Approaches**

- Public / Accessible
- Geometric guidance in vertical
- Precision Service equivalent to Cat 1 thanks to vertical Perfos
- Widely deployed (all QFUs in Europe with a procedure)
- Mandate in Europe (2030+) - ILS Cat 1 decommissioning



- **Not to be confused with RNP-AR:**

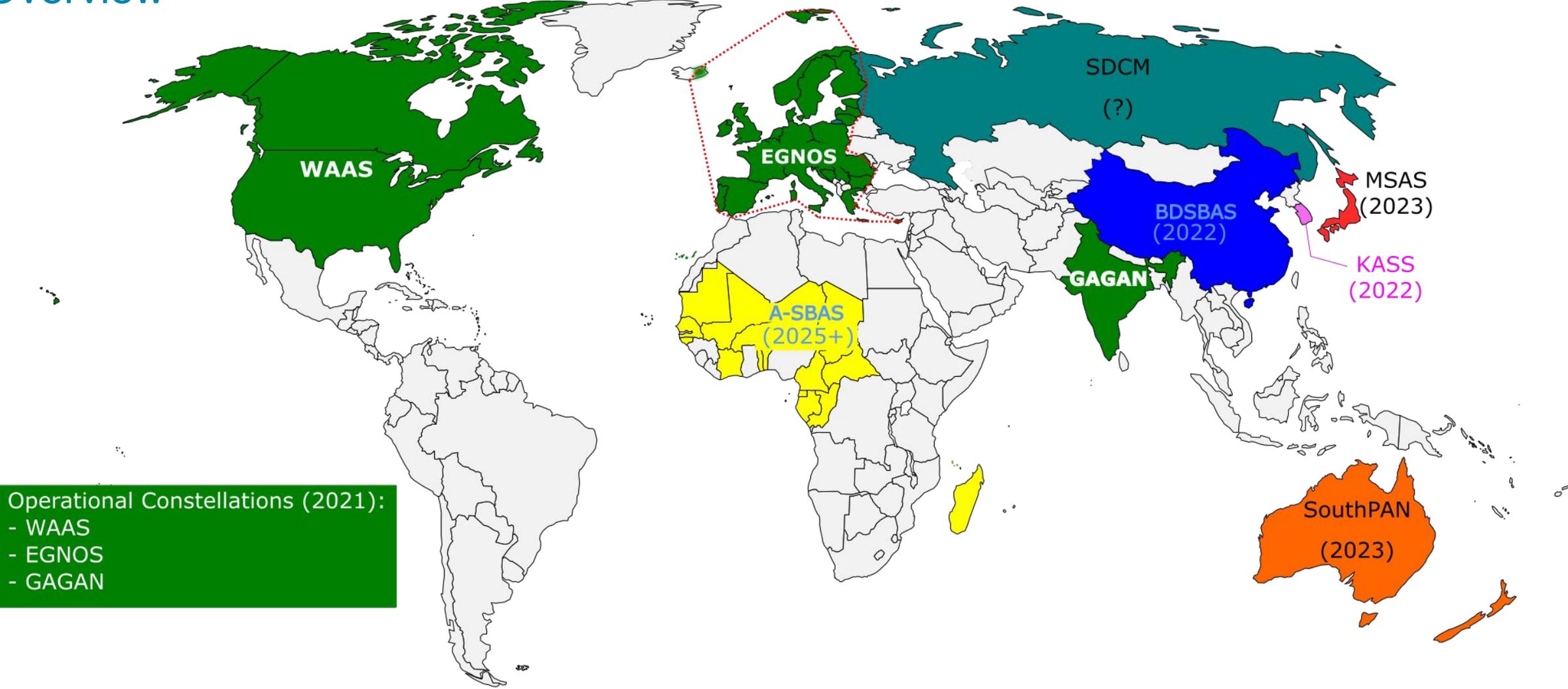
- Curved Approaches
- Guaranteed precision in horizontal
- Baro VNAV in vertical
- Non Precision Approaches (minima > 250 ft)
- Authorization required - Private procedures - Case by case operations



SBAS constellations worldwide

Overview

Mandate in Europe 2030+
With ILS Cat 1 decommissioning



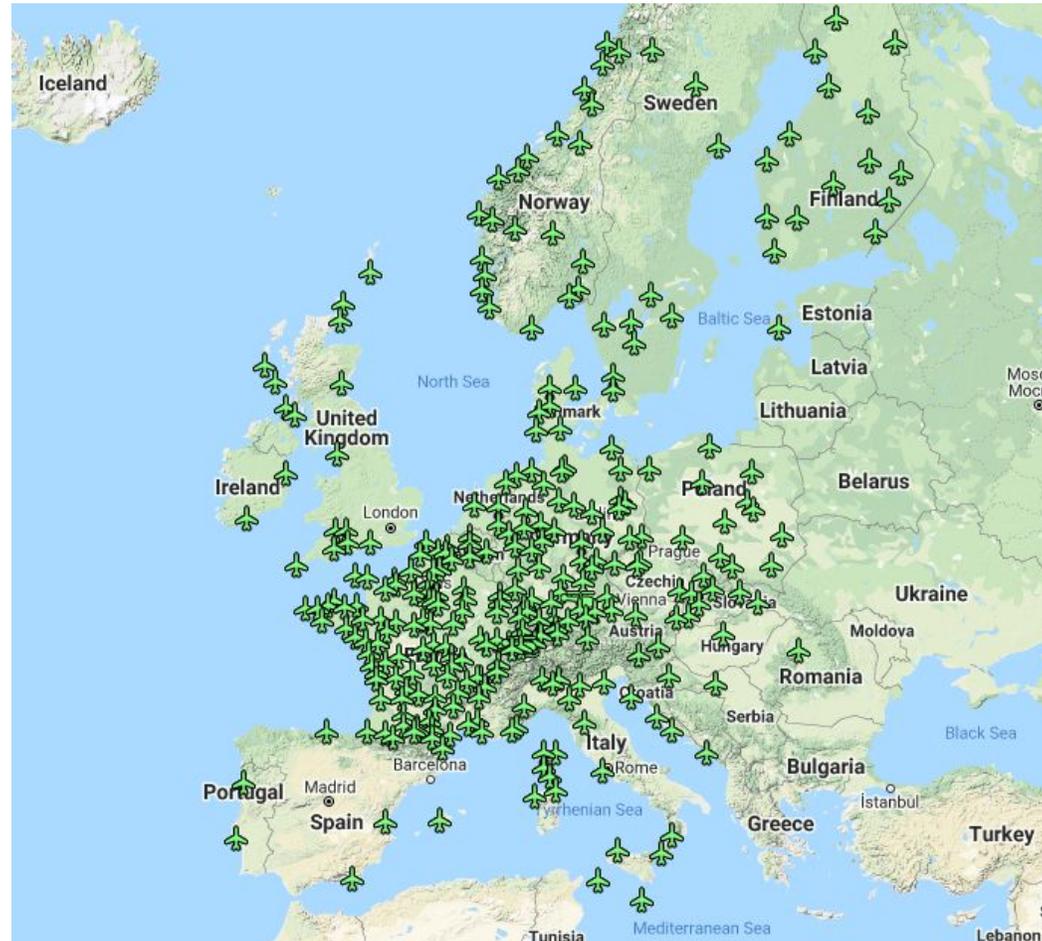
Operational Constellations (2021):
- WAAS
- EGNOS
- GAGAN

SLS Approaches

Examples of implementation

LPV implementation status in Europe (EGNOS)

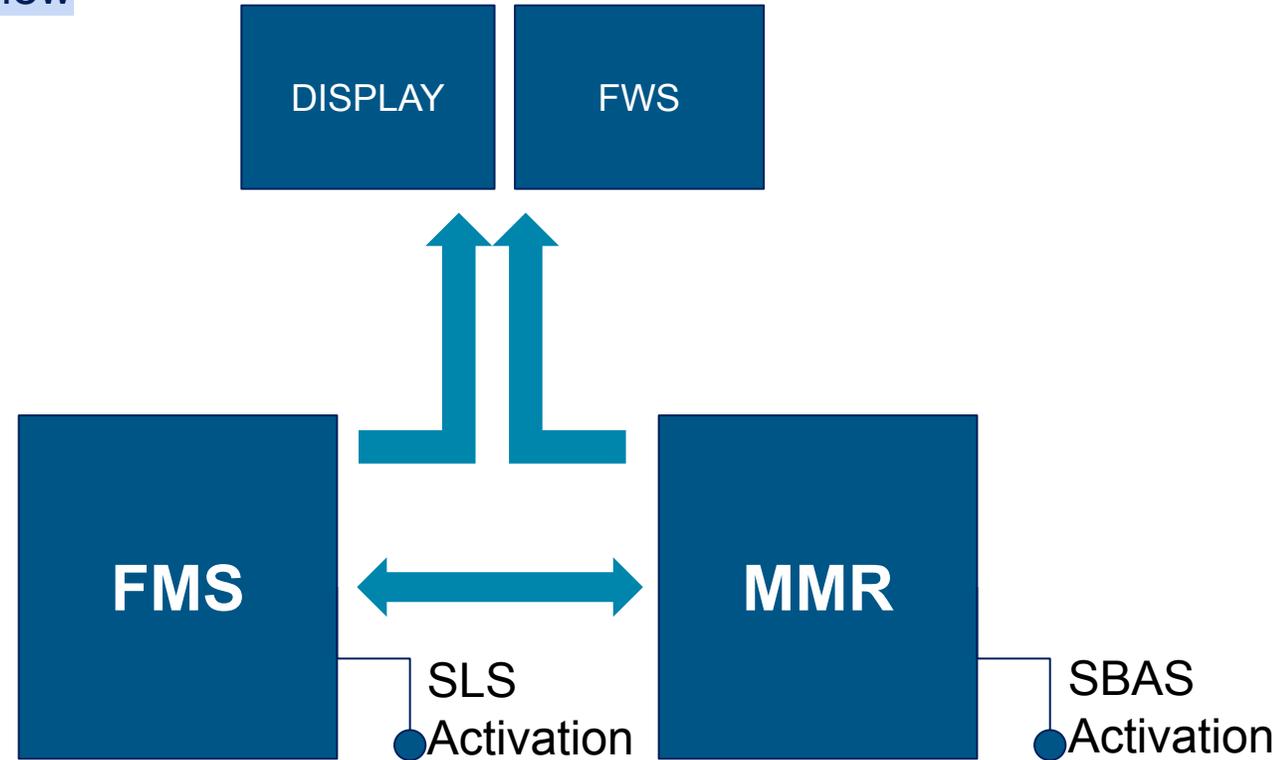
As of Jan 2020:
1067 LPV serving
809 airports
Including **276** LPV200



LPV Approaches with SLS

SLS function - Architecture overview

SLS Already available on A350 since 2015 Entry Into Service



Honeywell
THALES

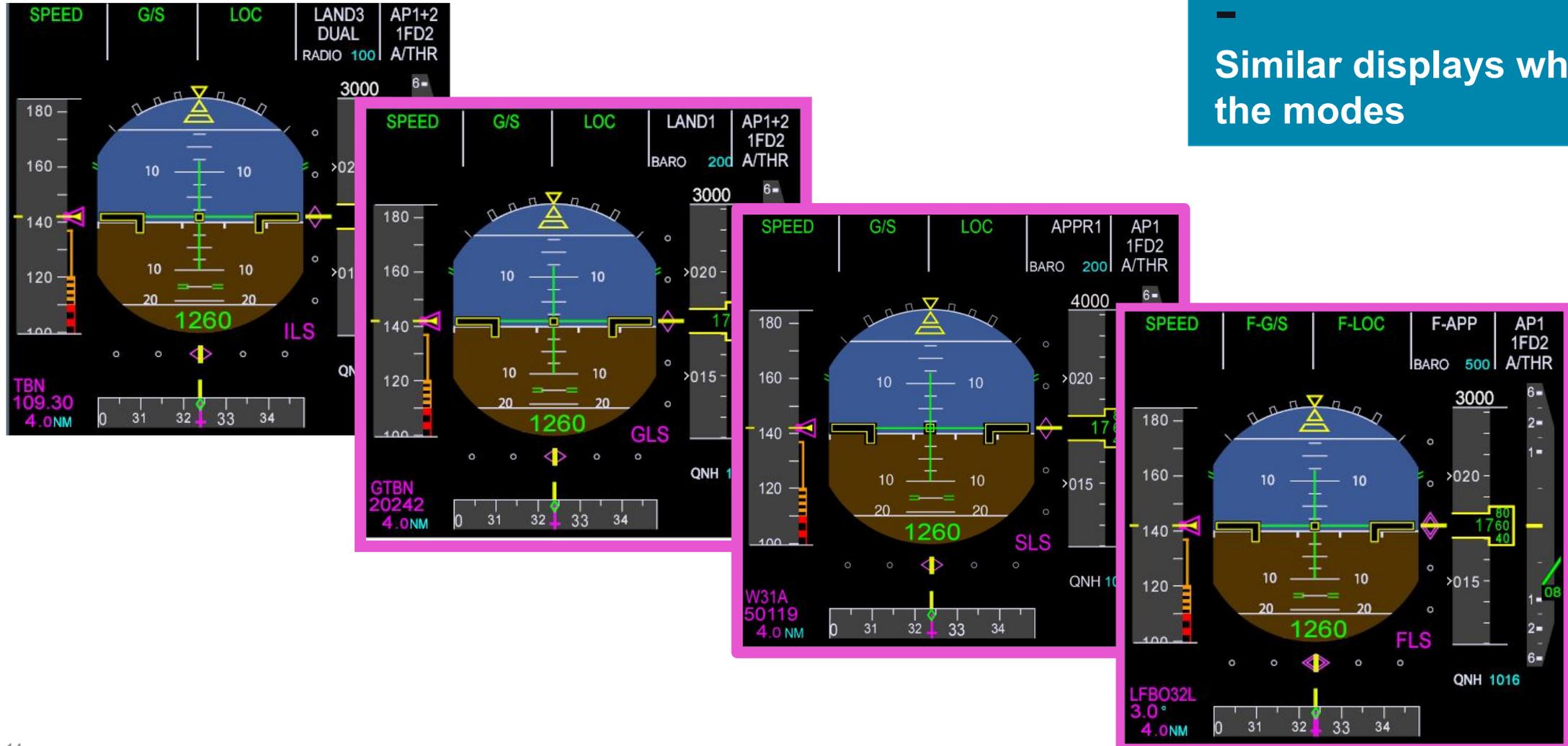
- ✓ (2021 A320
2022 A330)
- ✓ (2023+ A320/A330)

Honeywell
Collins Aerospace

- ✓
- ✓ (2021)

Approach Capabilities

Airbus xLS concept



ILS look-alike HMI
—
Similar displays whatever the modes

LPV Approaches with SLS

Display Overview before video

PRIMARY FLIGHT DISPLAY

- Short term data
- Attitude information (artificial horizon)
- Altitude, speed, Vertical Speed, Heading
- Guidance modes at the top (vertical, Lateral, Thrust)
- Weather/Terrain information



NAVIGATION DISPLAY

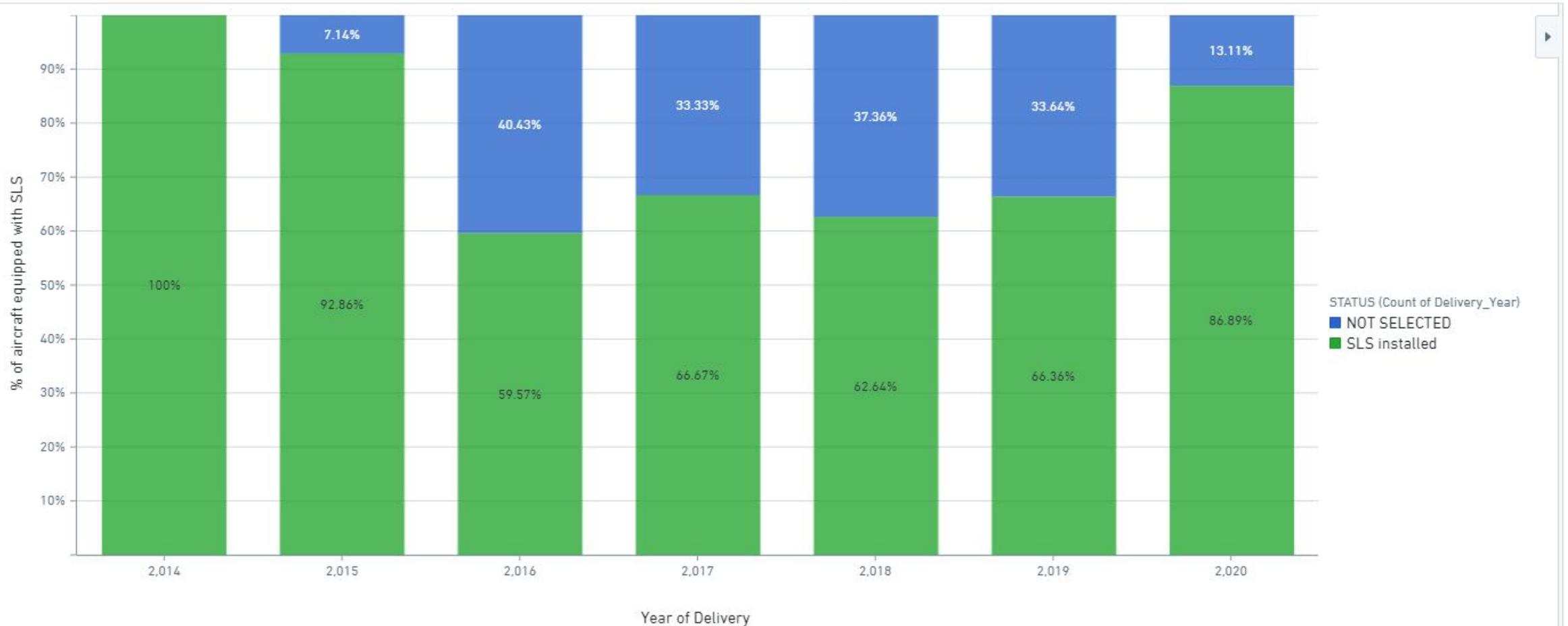
- medium-long term data
- Flight plan information
- Approach name at the top
- Weather/Terrain information

SLS Video

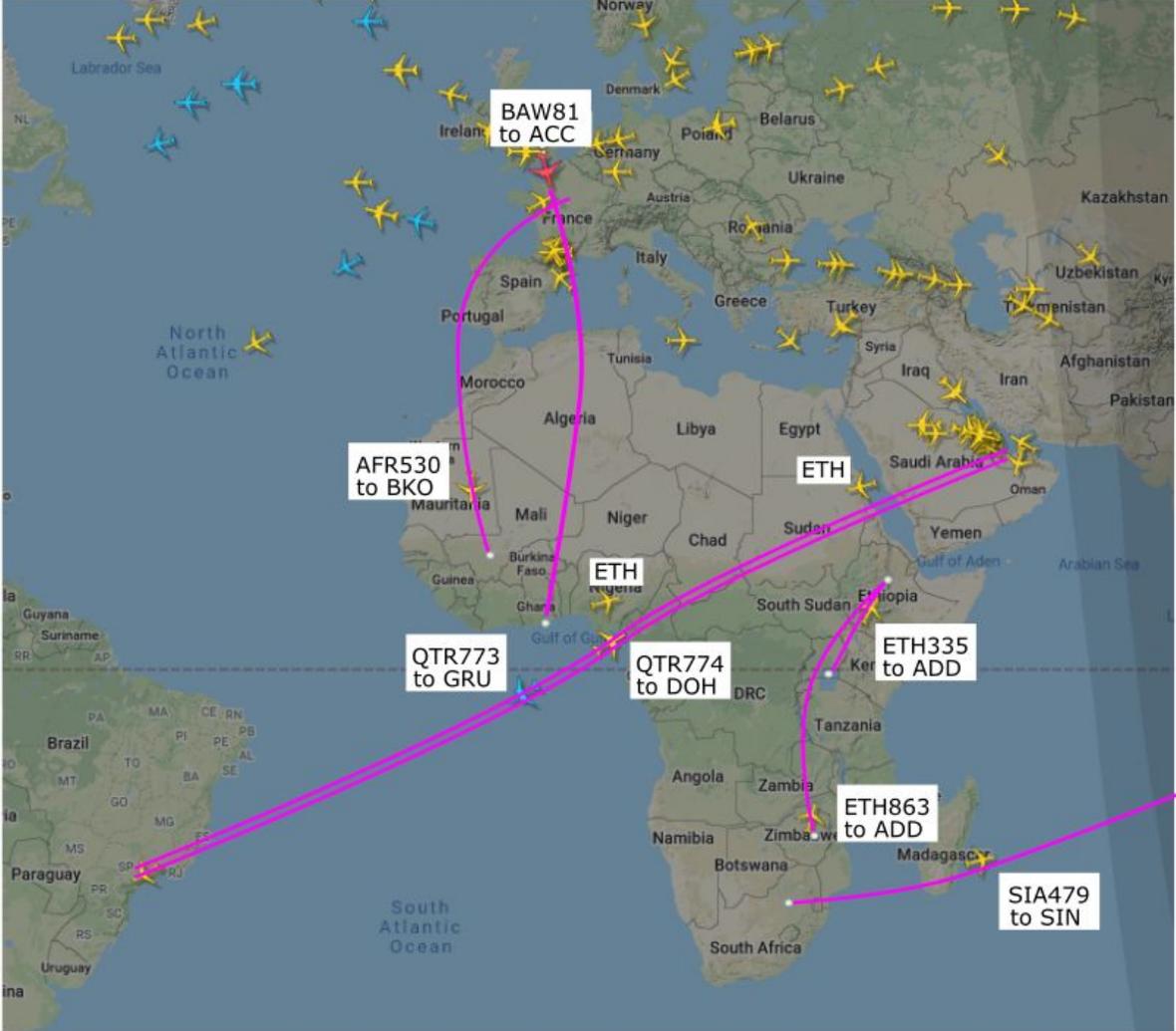


Level of LPV equipage Airbus A350 fleet

CHART



Yesterday Afternoon (4th March 2021) traffic over Africa...



SBAS/SLS installation in Final Assembly Line

New Aircraft

- **MMR capable of SBAS** available as of today in Airbus Catalog
- **SBAS** available as an option on A320, A330, A350 (soon on A380) and in standard offer on A220
- **SLS** available on A350 as an option and in standard offer on A220
 - Soon available on A320/A330/A380 as an option

Retrofit policy:

- MMR SB available right in time after forward fit availability
- No MMR wiring impact except SBAS activation
- Prerequisite for SLS (FMS, FWS, etc...)

Airbus Fleet Readiness review for A320/A330/A350/A380

SBAS & SLS function



A220
SBAS/LPV capability
Since 2016: Basic on all aircraft



A320
2019: SBAS
2021: SLS Cat I



A350
Since 2014: SBAS SLS Cat I
2019: SBAS for ADS-B



A330
2020: SBAS
2021: SLS Cat I

Airbus
Ready for
SBAS/SLS-LPV!



A380
2021: SBAS
2022: SLS Cat I

Thank you

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