सत्यमेव जयते

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MINISTRY OF CIVIL AVIATION, GOVERNMENT OF INDIA

भारतीय विमानपत्तन प्राधिकरण

AIRPORTS AUTHORITY OF INDIA

ICAO APAC SBAS-GBAS IMPLEMENTATION WORKSHOP FOR AIRSPACE USERS

"Enhancing airport accessibility and safety on final approach with SBAS and GBAS"

14th to 16th October 2025

Bengaluru, India

GBAS - SBAS Airbus fleet capabilities

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ICAO

Presentation Overview

01 xLS concept

02 SBAS and GBAS capabilities

03 GNSS jamming/spoofing roadmap

04 Autoland generalization

05 Conclusion

01

xLS Concept

xLS concept

Common HMI based on ILS
Common SOP for all straight approaches

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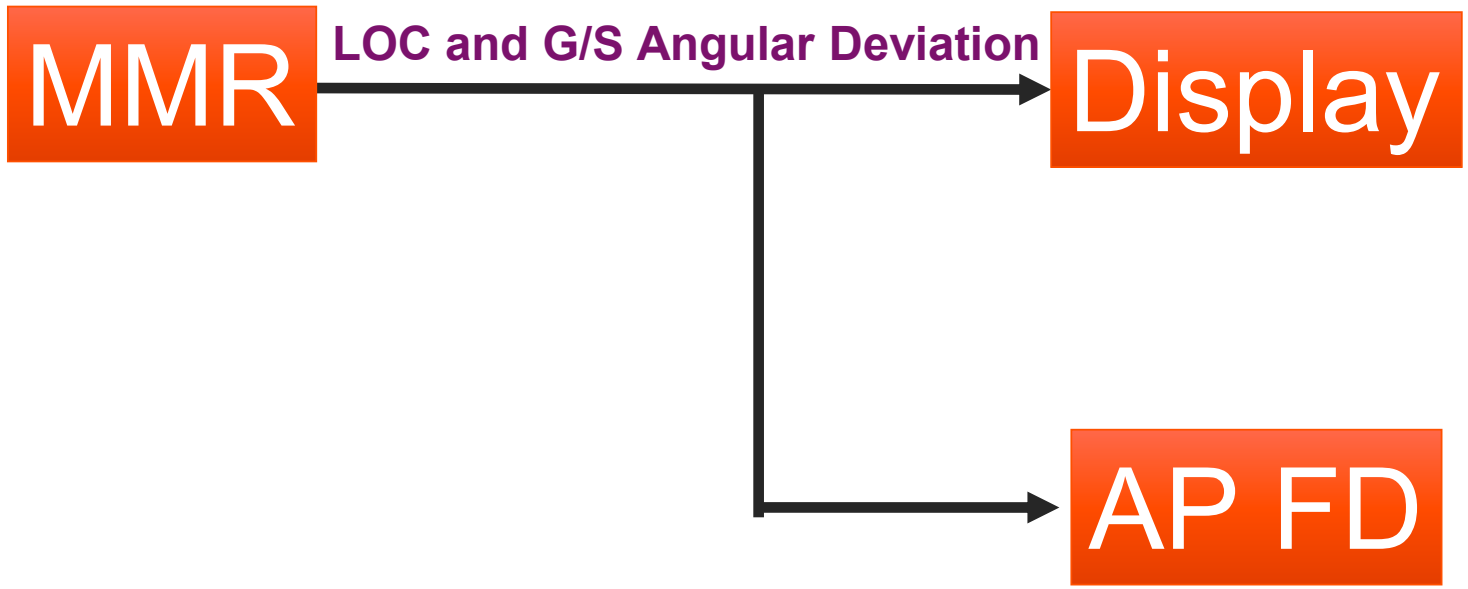
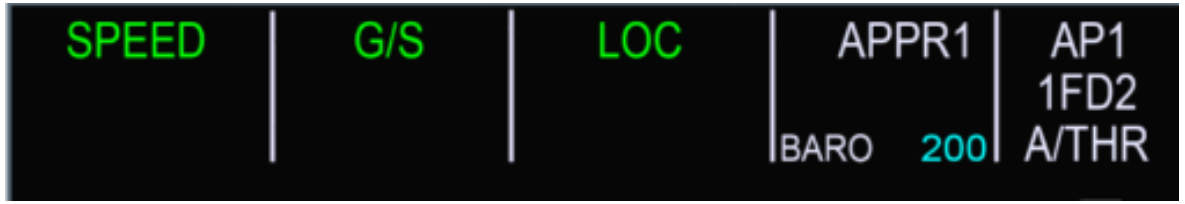
HMI: Human Machine Interface
SOP: Standard Operating Procedures

Same Architecture for Display and Guidance





AP: AutoPilot
FD: Flight Director
MMR : Multi Mode Receiver

« x » LS

xLS = Approach Guidance Mode

ILS FLS GLS SLS

Cover all the types of straight approaches

Difference between various xLS modes is **the source** used to compute the deviations

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ILS: Instrument Landing System
FLS : FMS Landing System

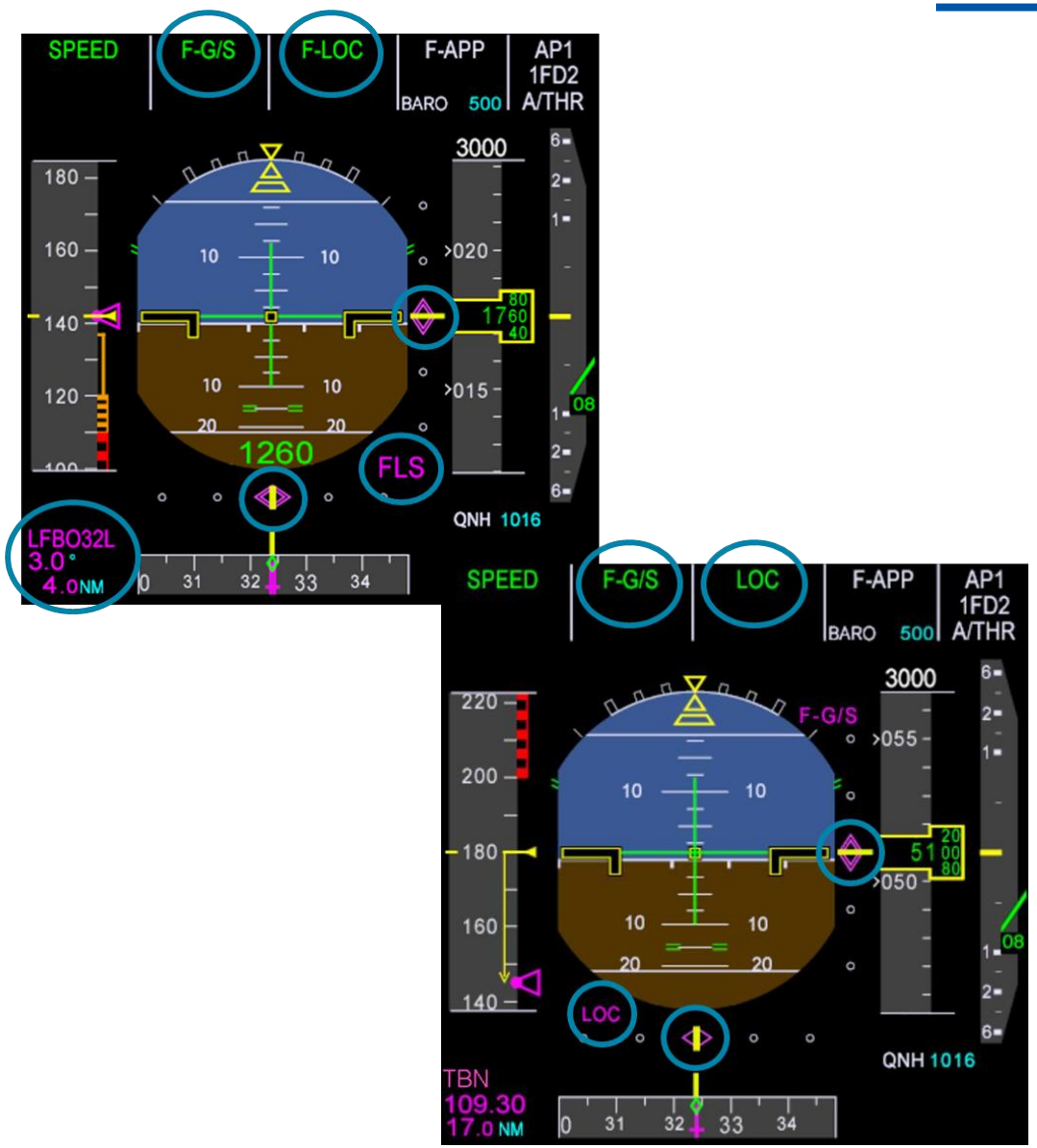
GLS : GBAS Landing System
SLS : SBAS Landing System

what is FLS?

FLS allows conducting existing **Non Precision Approaches** (VOR, VOR/DME, NDB, NDB/DME, , LOC only))and **LNAV/VNAV approaches** in a similar manner as **Precision Approaches (ILS)** with similar display, guidance & alerts.

The aircraft is guided along a **“virtual” beam** computed by the FMS, **corrected from low temperature.**

Standard **ILS laws** used by the AP/FD for guidance.



02

SBAS and GBAS capabilities

SLS function

Airbus function to fly **LPV approaches**

- ❑ Provides geometric lateral and vertical guidance
- ❑ Common HMI based on ILS
- ❑ Performance equivalent to CAT I ILS : DH down to 200ft
- ❑ Extends precision approach service to more airports

GLS function

- Provides geometrical lateral and vertical guidance
- Common HMI based on ILS
- Performance equivalent to CAT I ILS : DH down to 200ft with autoland
- GLS CAT II certified with MMR GLU925 using GBAS GAST-C ground station with SBAS receiver
- Based on local GBAS infrastructure

xLS Safety Benefits

- **Enhanced guidance in final approach** thanks to **angular** lateral & vertical guidances
- **SLS and GLS provides geometrical vertical guidance**
  - Not sensitive to temperature
  - Vertical guidance not sensitive to altimeter setting errors
- **SLS and GLS are xLS look-alike concept (level A training)**
  - Enhance crew interface and awareness
  - Reduce crew workload

Airbus Fleet Readiness review for A220/A320/A330/A350/A380

SLS and GLS function in Forward Fit

A220

2016: LPV capability
(different from xLS concept)

A320

2009: GLS CAT I with autoland
2021: SLS CAT I

A350

Since 2014:
GLS CATI with autoland
SLS CAT I

A330

2014 : GLS CAT I with autoland
2022: SLS CAT I

Airbus
Ready for GLS/SLS!

A380

2008 : GLS CAT I
with autoland
2022: SLS CAT I

AIRBUS

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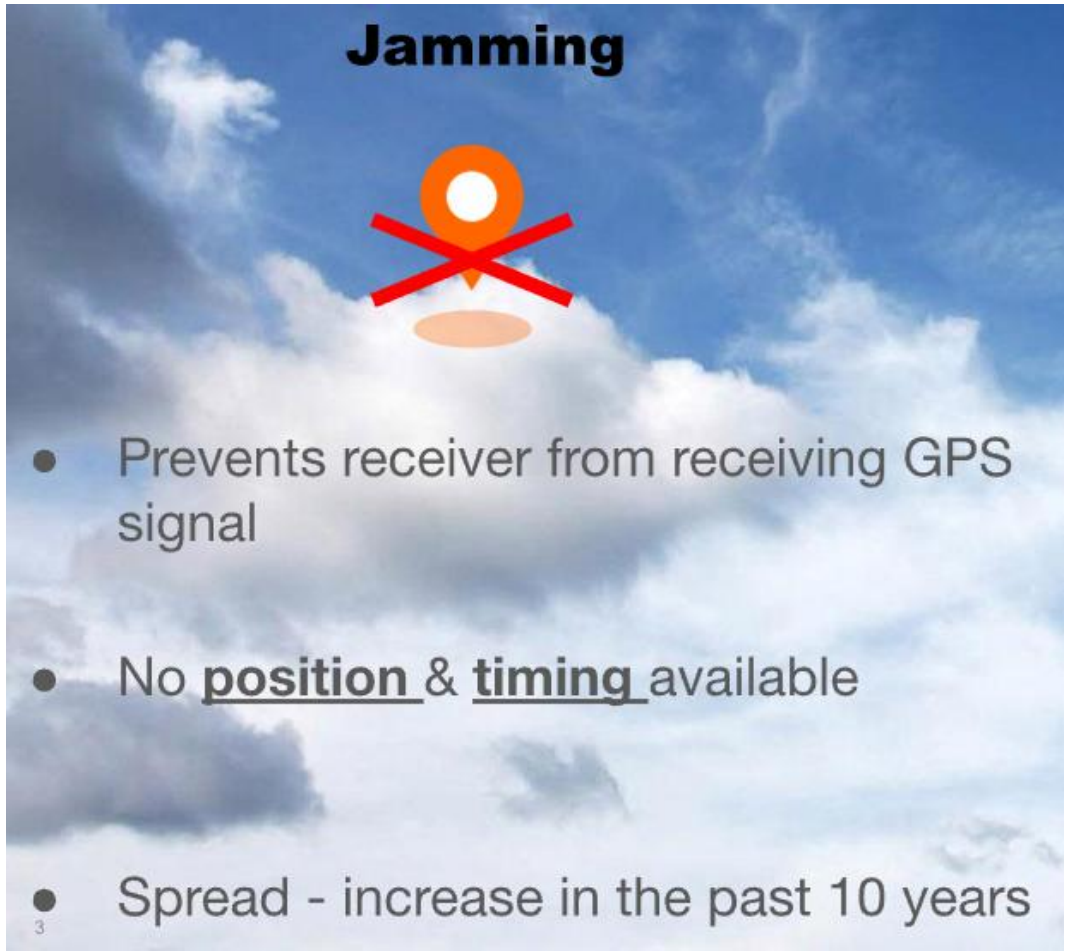
Airbus fleet readiness synthesis for A320/A330/A350/A380

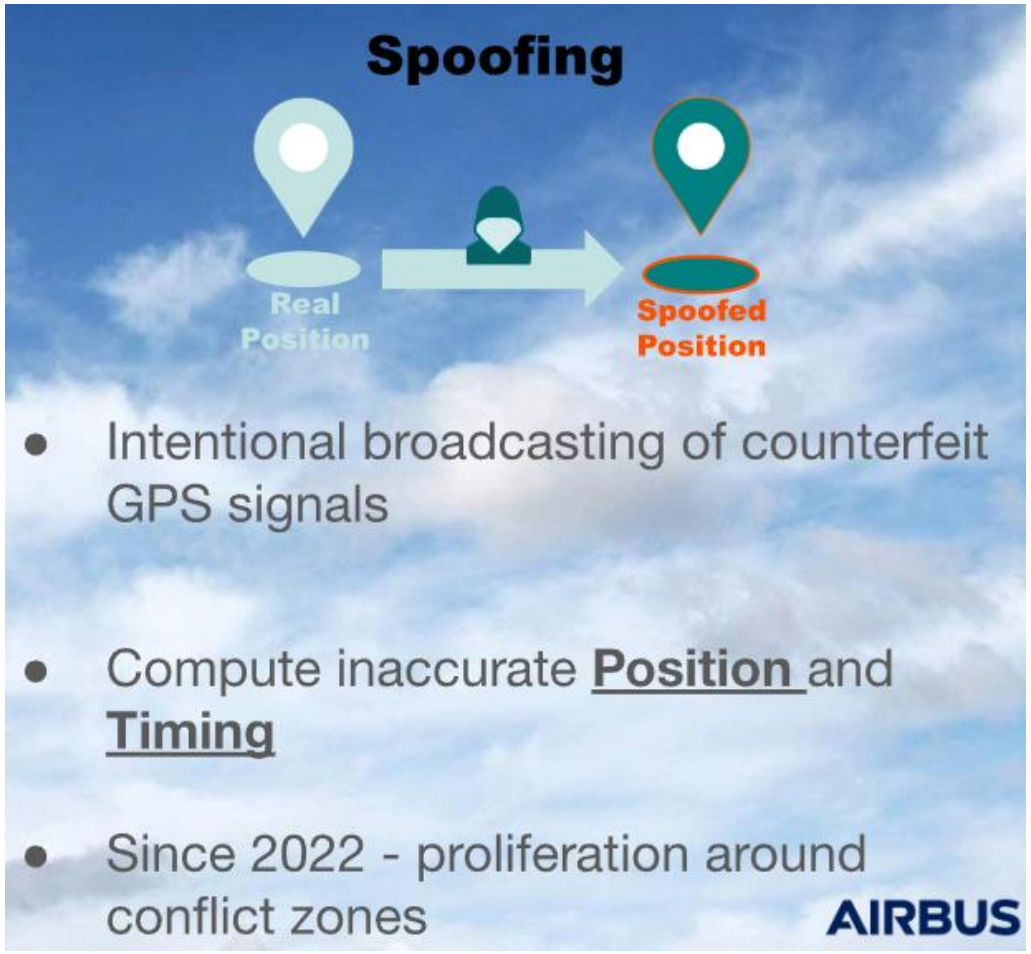
	A220	A320	A330	A350	A380
ILS	BASIC	BASIC	BASIC	BASIC	BASIC
GLS	N/A	OPTION	OPTION	OPTION	OPTION
SLS	BASIC LPV capability but different from SLS	OPTION	OPTION	OPTION	OPTION
FLS	N/A	BASIC	BASIC	BASIC	BASIC

03

GNSS jamming and spoofing

What is jamming and spoofing?





Airbus Three Step Approach

Enhance Resilience
Accelerate the introduction of more resilient solutions proposed by our suppliers

2

3

Be Resilient
R&D work to provide resilient CNS functions

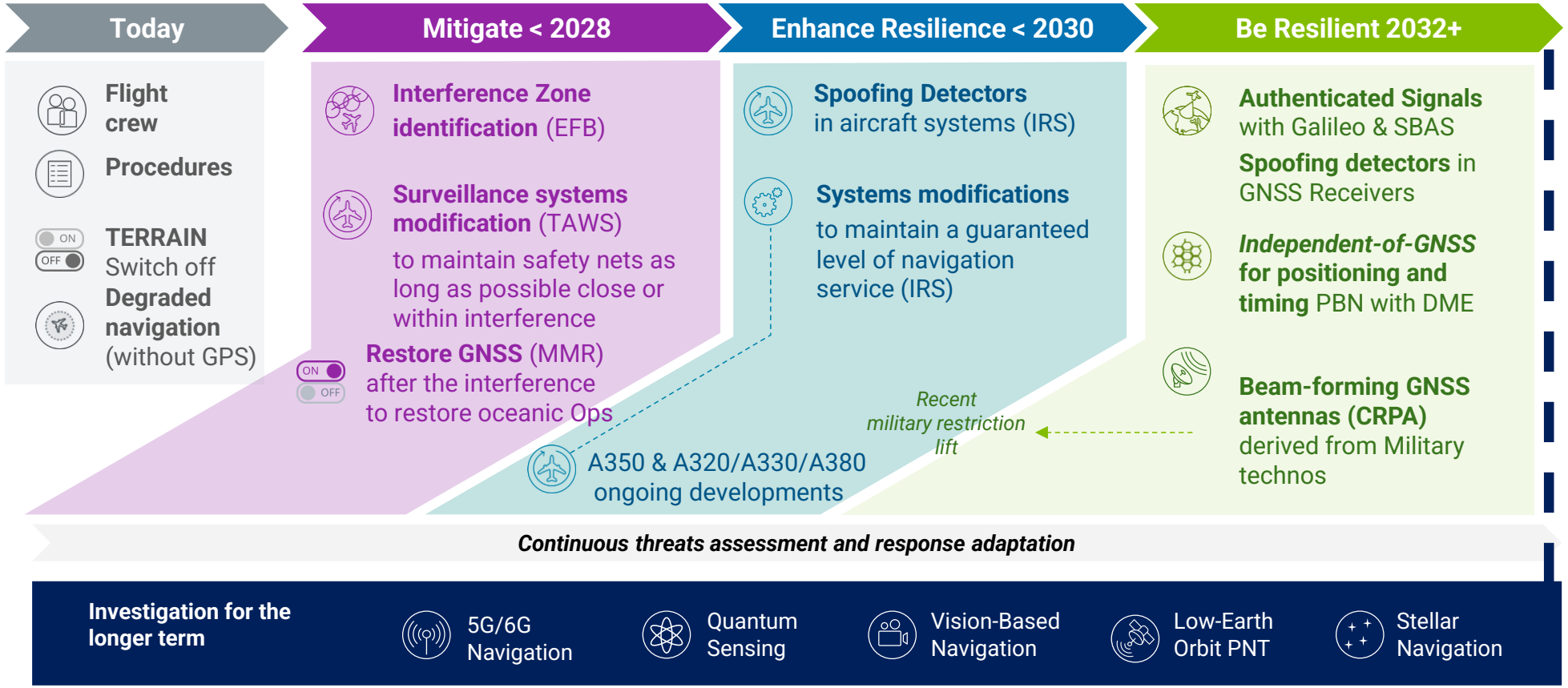
1

Mitigate
FCOM procedures, contain the spurious TAWS rate, restore the availability of the surveillance (TCAS, WXR and PWS), time, data link, and RNP

TCAS: Traffic Collision Avoidance System
PWS: Predictive Wind Shear
RNP: Required Navigation Performance
FCOM : Flight Crew Operating Manual

TAWS: Terrain Awareness Warning System
WXR: Weather Radar
CNS: Communication, Navigation, Surveillance

Airbus Roadmap to address GNSS interference



GNSS: Global Navigation Satellite System
Controlled Reception Pattern Antenna
PNT: Positioning, Navigation and Timing

PBN: Performance Based Navigation
EFB: Electronic Flight bag

IRS: Inertial Reference System
DME: Distance Measuring Equipment

TAWS: Terrain Awareness Warning System
MMR: Multi-Mode-Receiver

CRPA:

04

Autoland generalization

Improves Safety - Autoland Generalisation

- When used, autoland is a capability provided to airlines which contributes to **safety enhancement** :
  - Reduce Lateral runway excursions
  - Reduce Go-arounds
  - Avoid any risk of Hard landings

- Autoland as a tool to be used **when deemed appropriate** and **not limited to LVO**

Crew fatigue

Cross Wind

Difficult visibility

Failures

- Ambition : **Certify autoland for non-LVO operations**

- under development for SLS CAT I as the most promising enabler for autoland in non-LVO operations
  - Not subject to ILS sensitive areas perturbations, widespread deployment

LVO: Low Visibility Operations

SLS autoland development status

- **SLS autoland development launched** with the following **certification targets (TBC)**
  - On A350 - End of 2027
  - On A320 family - End of 2028

- **SBAS error model accepted by EASA** to perform SLS Autoland **certification demonstration**
  - The main outcomes are:
    - Model considered representative of EGNOS error only by EASA. Additional activities will be requested to extend its applicability to other SBAS
    - Autoland demonstration will cover RNP approach with LPV minima designed for CAT I SBAS service level (also called LPV-200)
  - Model will be standardised in an upcoming revision of ICAO Annex 10

- Definition of **certification demonstration activities with EASA will start end of 2025**

- **Development flight tests performed** on A320 and A350 families (in Europe and US) - Good behaviour of the A/C

Feedback request

- Airlines
  - For Autoland in LVO, how do you assess runway eligibility?
  - Do you currently use Autoland outside LVO? If you do:
    - what is the airline policy for its use?
    - how do you assess eligibility (including CAT I runways if applicable)?
  - Would you find it useful to have Autoland certified for non-LVO operations (beyond GLS)?
  - Do you foresee any challenge for its operational use?

- ATC
  - Would there be any operational impact if part of the traffic requested LPV approaches to use Autoland outside LVO (e.g. assuming ATC is proposing ILS by default)?

05

Conclusion

Conclusion

- SLS and GLS fully integrated in xLS concept
- xLS is a safety enhancement as it allows to fly all straight approaches in similar manner with 3D guidance down to the runway
- SLS/LPV capability available for all Airbus programs
- GLS capability available for A320/A330/A350 and A380 families
- Airbus roadmap established for enhanced robustness to GNSS RFI
- SLS autoland in development for A320 and A350 programs

Thank You!

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