SBAS
Opportunities and Challenges

EU Space Week
Dec 05/18

AIRFRANCE

Air France

History and fleet

Since 1933…

Today…

A320 Fam.

A330

A340

A380

777

787

800 flights / 130,000 Pax daily – 25,000 Ground staff – 12.000 Flight Attendants – 3600 Pilots

Tomorrow…

A350

xxx…

Air France
Group

transavia

- 36 737-800

Seasonal / holidays destinations

150 flights / 20,000 Pax daily – 1500 staff

HOP!

- 25 CRJ 700/1000
- 39 Embraer eJET
- 14 ATR 42 / 72

Regional

400 flights / 15.000 Pax daily – 3000 staff

Fundamentals

Priorities & Regulations

MANDATES
REGULATIONS

1 – SAFETY FIRST

2 – CUSTOMER

3 – COSTS - EMISSIONS

SBAS Benefits

Safety First

SÉCURITÉ DES VOLS

1. SBAS LPV approaches preferred to LNAV/VNAV

   - Not limited by low temperature (vertical profile)
   - Not linked with QFE setting. CFIT / unstable approach risks removed

2. Continuity and integrity of GNSS position

   - No RAIM check

3. Dual Frequency / Multi-constellation

   - Multi-frequency: no ionospheric errors
   - Multi-constellation: redundancy, worldwide coverage

   ➢ GNSS to become primary mean of Navigation

SBAS Benefits

Safety First

SÉCURITÉ DES VOLS

4. Africa : support ASECNA initiatives for SBAS

   - Very significant safety improvement
     - Precision approaches for all terrains, all runway ends
     - Safer than LNAV/VNAV

   - “Fast” and sustainable
     - No need for ground station deployment plan
     - No maintenance

5. And more to come…

   - Combine LPV 200 minima capability with Enhanced/Synthetic Vision Systems to allow CAT 3 approaches

SBAS Benefits

Customer satisfaction (1/2)

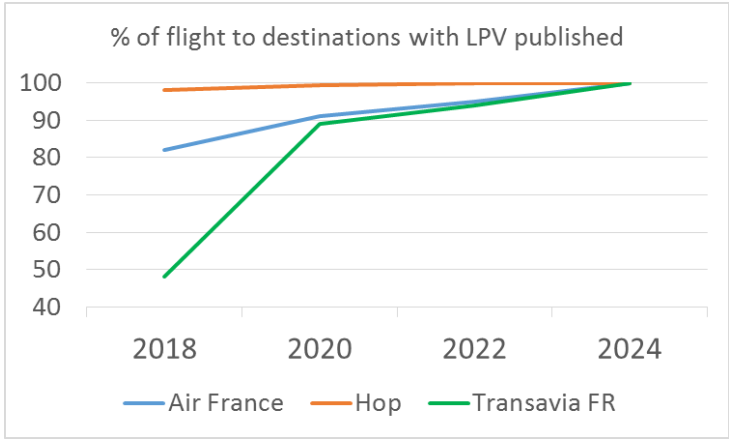
1. A mean to avoid operational disruptions

SBAS LPV approaches: increase landing capabilities

- LPV Vs NPA DH
- Airports with 0 or 1 ILS (regional or seasonal destinations)
- ILS under maintenance / interferences

LPV-200 approaches mandated
2020: all NPA QFUs
2024: all QFUs

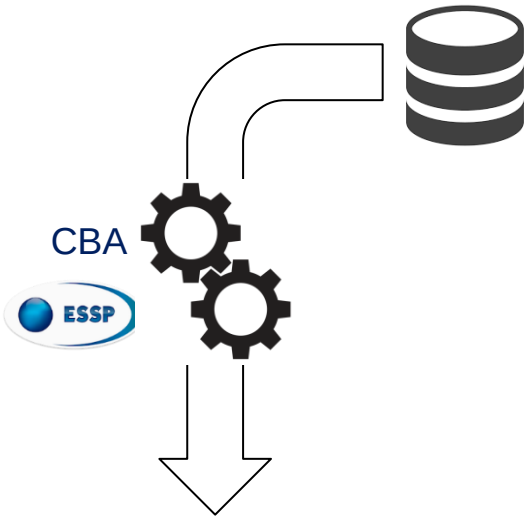
<u>We have to take benefit of that !</u>



SBAS Benefits

Customer satisfaction (2/2)

Some figures…



- Historical weather data
- Actual QFU used
- AF top 15 and 0/1 ILS destinations
- LPV Vs NPA DH

Airline	Potential Disruptions Avoidable	Passengers affected	Savings (# aircraft SBAS retrofit)	ROI
Air France A320	100	30,000	10	10 Yr
Hop !	60	10,000	10	7 Yr
Transavia FR	65	25,000	7	6 Yr

(Order of Magnitude – Per Year)

SBAS Benefits

Costs and emission reduction

1. GNSS accuracy and integrity: enabler for PBN operations
    - Flexibility – direct routes
2. ILS decommissioning
    - We expect decrease in airport charges
3. Fuel savings
    - Closest alternates
    - Improve airport capacity
        - Optimized approaches (RNP 0,3 only for final approach today)
        - Displaced runway threshold
        - Multiple glide slopes

        ➢ Enabler to reduce separation in approach
        ➢ Opportunity for environmental improvements

SBAS - Regulations

1. ADS-B US mandate

   Aircraft position accuracy mandated

   - January 2020
   - FAA Exemption possible until 2025 under conditions

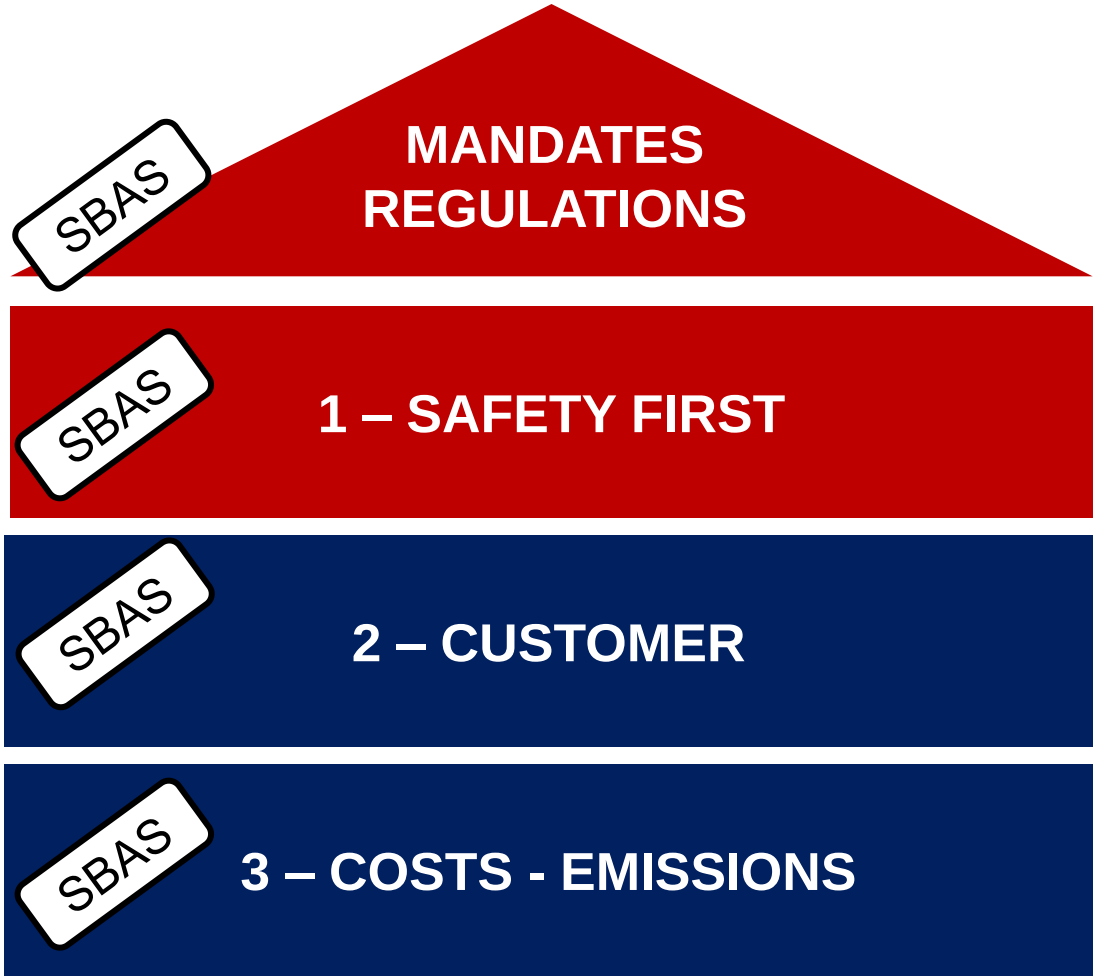
   ➢ “SBAS” MMR needed by then

2. SBAS to support ADS-B as a primary mean of surveillance

   ➢ Secondary radar rationalization / decommisionning

Fundamentals

Priorities & Regulations



We want to go !...

But still some challenges on the road…

Challenges

Aircraft modifications

1. Aircraft modifications

- Long process for any modification
  - 2 Years
  - Logistics
  - Pilot training
  - Mix fleet management
  - Other equipment/computer dependency

- Costs of avionic upgrade
  - BC demonstration
  - Modification priorization (SBAS not the only one..)

→ Need to optimize and avoid successive modifications

Challenges

Avionics availability

2. Avionics availability

- No SBAS MMR available yet
- A320: “LPV-ready” Thales FMS not planned yet. So no visibility SBAS on our A320
- A380 : under study
- SBAS Availability on Boeing aircraft ?

	A320	A330	A340	A350	A380	777	787
							
MMR	2020	2020	2020	✓	2020	2020	2020
FMS	— NOT AVAILABLE WITH THALES FMS —			✓	2022 ?	?	?
FG/EIS/FW	2020	2020	2020	✓	2022 ?	?	?
SLS Option	2020	2020	2020	✓	2022 ?	?	?

Challenges

MCMF - BC

3. MCMF MMR availability

   - Eurocae specifications for EGNOS V3 to be issued as soon as possible

4. SBAS Business case to be demonstrated today

   - Airport capacity benefits to be evaluated

   - LPV should be basic on new aircraft types (not the case today !)
   - Incentive policy to support retrofit

     ➢ SBAS to be a standard from 2030 on

Strategy

1. One word about GBAS

    - SBAS and GBAS Cat 3 : Cheese and dessert !

2. New aircraft

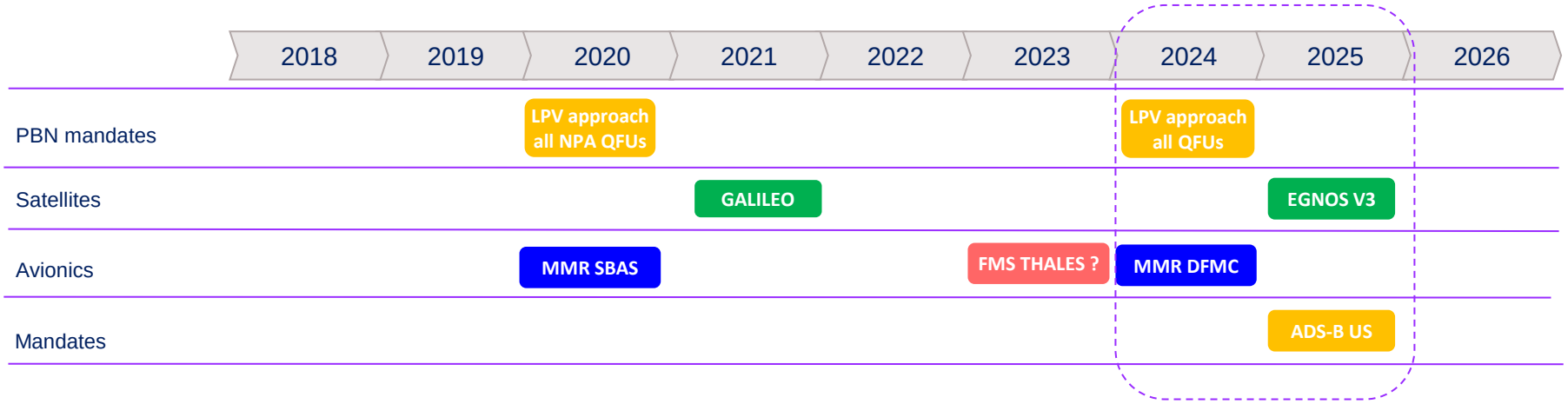
    - SBAS LPV 200 capability systematically required

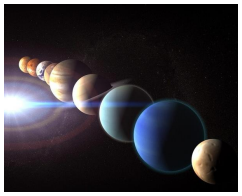
        ✓ Option selected on A350

Strategy

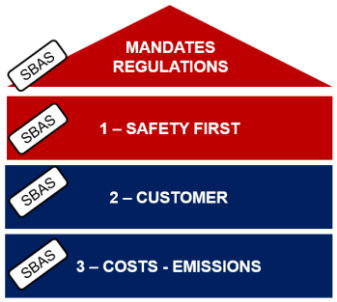
3. Retrofit

- Monitor Industry / Mandates
- Regional / seasonal fleets: consider implementation
- No immediate MMR upgrade
- Target LPV 200 implementation at “planet alignment” : 2024/2025





Conclusion



We want to go !...

Thank you !

Avionics availability

Basic on new aircraft

Need to optimize and avoid successive modifications

BC to be demonstrated – Incentive to support retrofit

Africa

SBAS “planet alignment” : 2024/2025

SBAS to be a standard from 2030 on