# Evolving and improving landing networks with EGNOS

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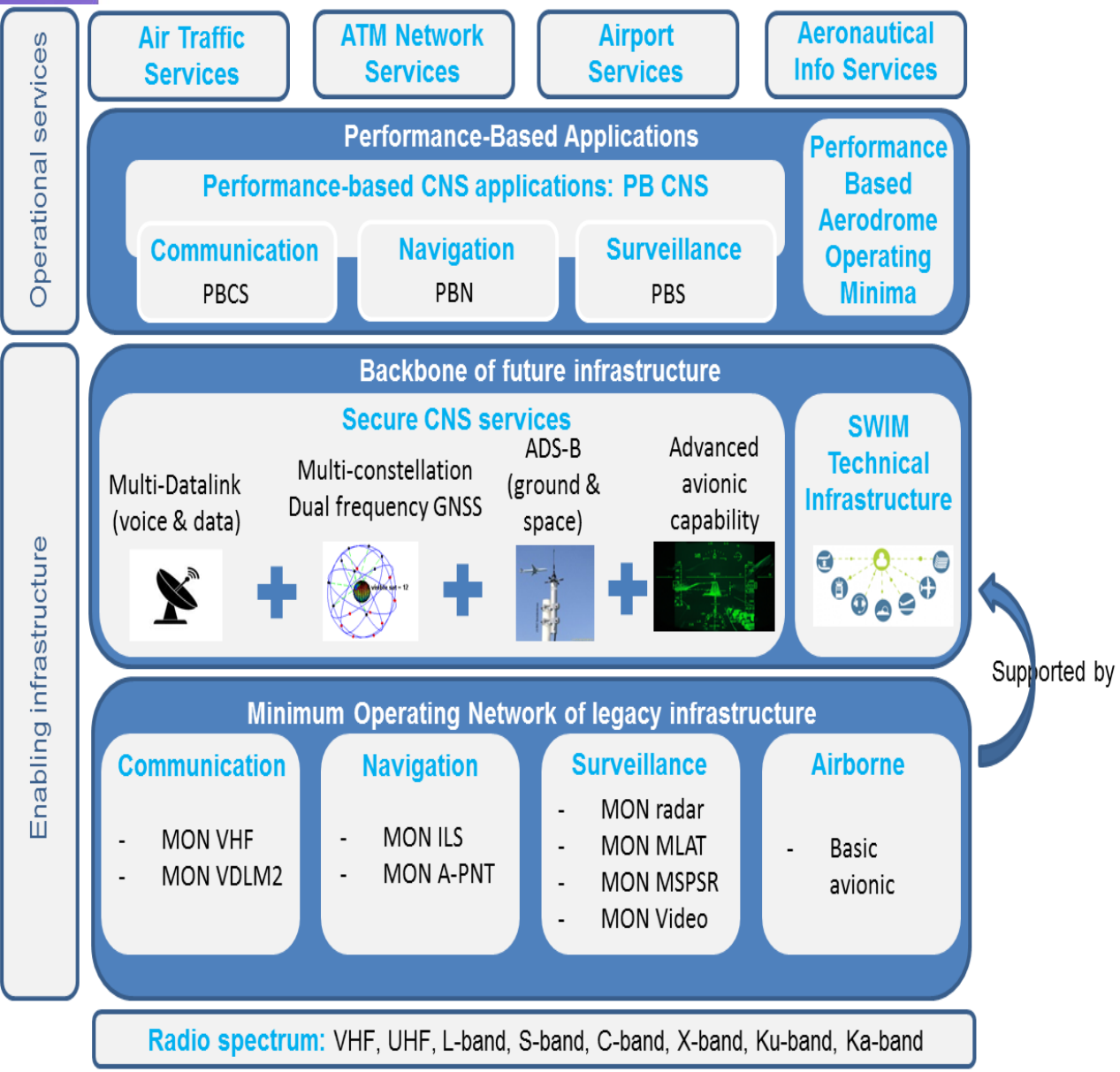
EU Space Week Marseille

# INTRODUCTION

- **Satellite technology opportunities allow now ANSP and airports to complete/redesign approach and landing networks**
  - **System layer: GNSS**
  - **Application layer: PBN (Performance Based Navigation)**
- **Opportunities include reducing infrastructure costs, while maintaining and even improving airport accessibility and safety**
- **Consultation of airports and airspace users is required**
  - **Building a common understanding**
- **Assessing pro & con's of the different GNSS technologies is a key factor to implement the changes**
  - **ABAS**
  - **GBAS**
  - **SBAS (EGNOS in Europe)**

# INTRODUCTION




- **This landing networks evolution is in line with SESAR recommandations to start building Minimal Operating Networks (MON)**

# CONVENTIONAL NAVIGATION APPROACH AND LANDING SYSTEMS LESSONS LEARNED

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RÉPUBLIQUE FRANÇAISE
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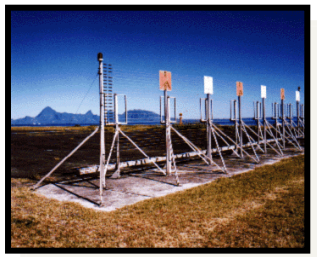
# Conventional Navigation networks France

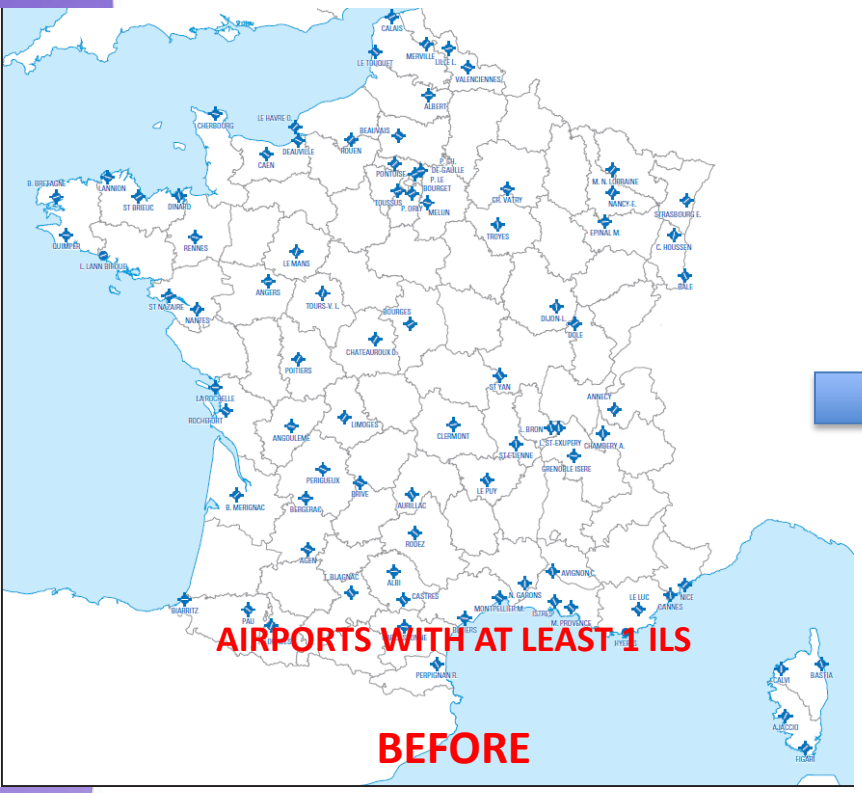
- **Instrument Landing System (ILS)**
  - 23 owned ILS  Cat III **no change**
  - 98 DSNA owned ILS Cat I, **now down to a Minimal Operating Network  (MON) of 49 DSNA owned ILS**



- **VHF Omni Range (VOR)**
  - 96 DSNA owned VOR
  - **Minimal Operating Network studies** launched

- **Non Directional Beacon (NDB)**
  - 104 DSNA owned NDB
  - **Minimal Operating Network studies** launched

# ILS CAT I MON actual implementation





**About 5 M€ yearly savings**
**Contributes to the French**
**Landing Tax reduction program**

2018 : 225,50 €
2017 : 224,45 €
2016 : 227,1 €
2015 : 228,62 €
2014 : 233,23 €

# Conventional approaches lessons learned

- **Cat I level of performance is ideal for most airports**
  - **Supports accessibility 95% or more of the time** for French airports
  - **Vertical guidance** supports improving safety
  - **Ideal target for PBN procedures and avionics** in the future
    - NB: Near Cat I (i.e. SBAS APV I ) is also meeting such objectives

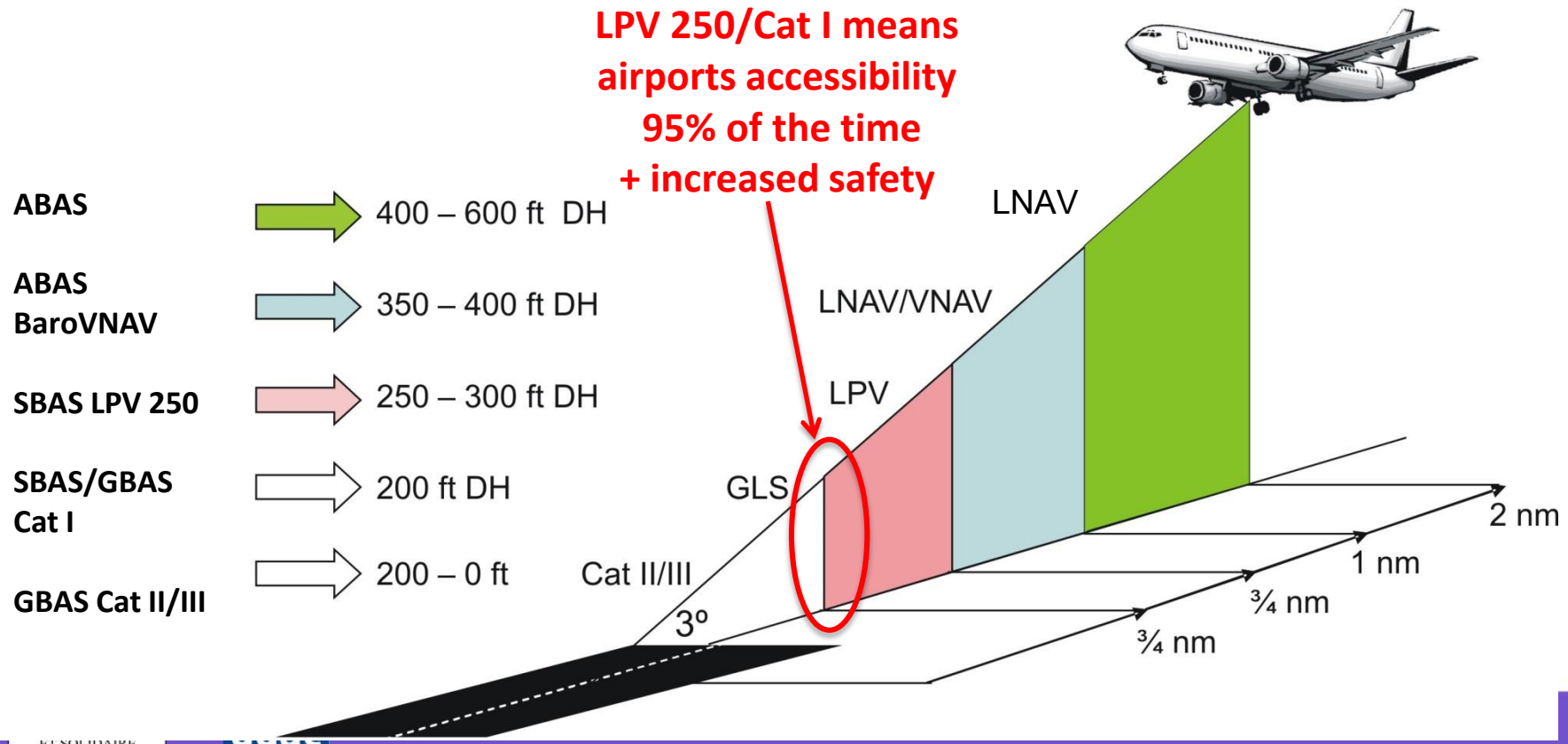
- **Rationalizing ILS « quite easy »**
  - Depends on the density of the initial network
  - **Availability of SBAS signal is a key asset** to maintain equivalent accessibility
    - **In this context, GBAS Cat I unfortunately not helpful** due to ground stations cost and lack of user avionics for the smaller airports
  - **European (GSA) avionics subvention plan** was an important tool

# OTHER ENABLERS TO ACHIEVE THE TRANSITION TO AN ILS MON

# PERFORMANCE BASED NAVIGATION (PBN) APPROACH MINIMA

- **Typical performance of 2D/3D GNSS guided approaches**

## France PBN target:



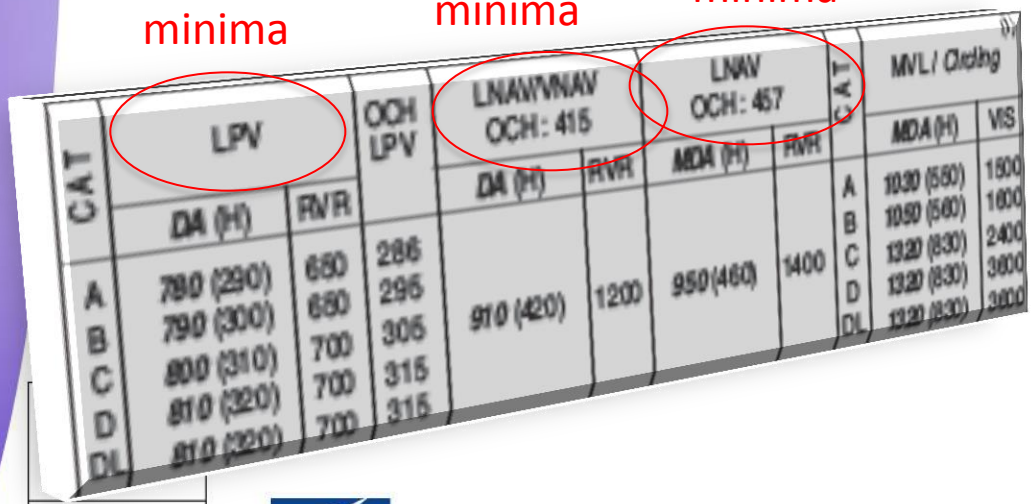
# PBN LANDING CHART

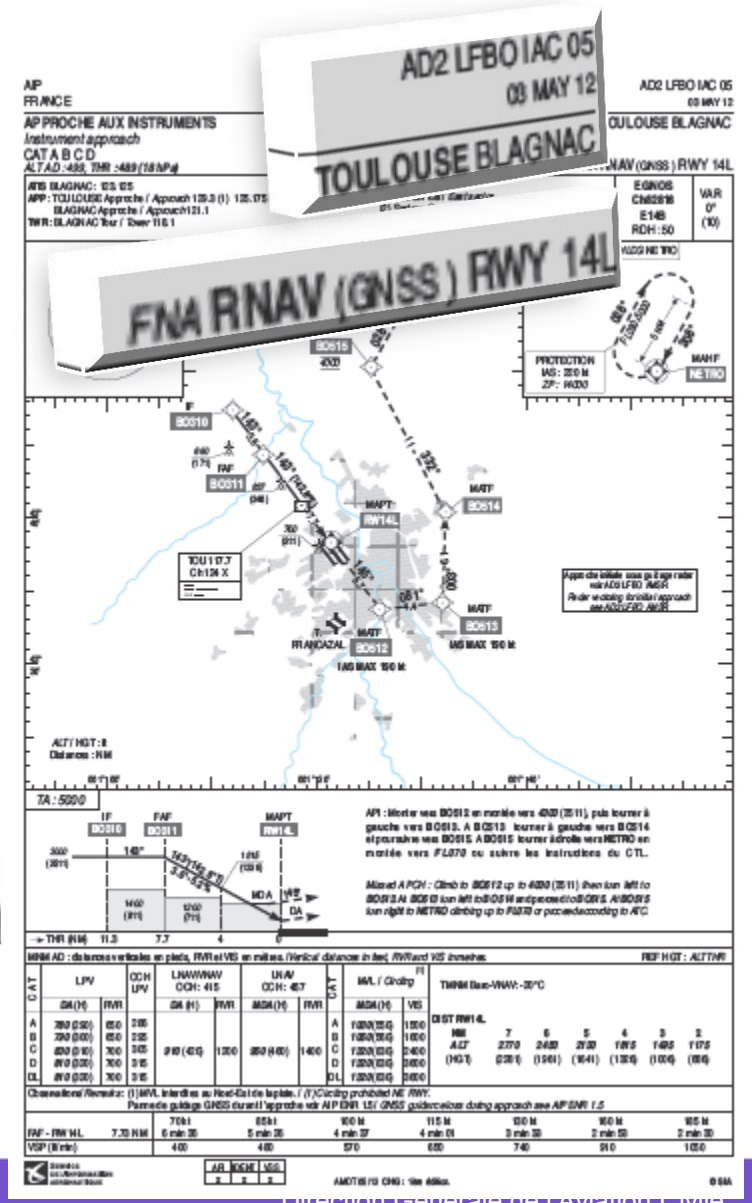
- **France implements ICAO charting concept for PBN, down to LPV 250 ft or Cat I**
  - **Supports an easy introduction over aiports**
  - Manages smoothly different generation of avionics
  - Avionics equipment transparent to ATC

EGNOS SBAS minima

GPS ABAS+BaroVNAV minima

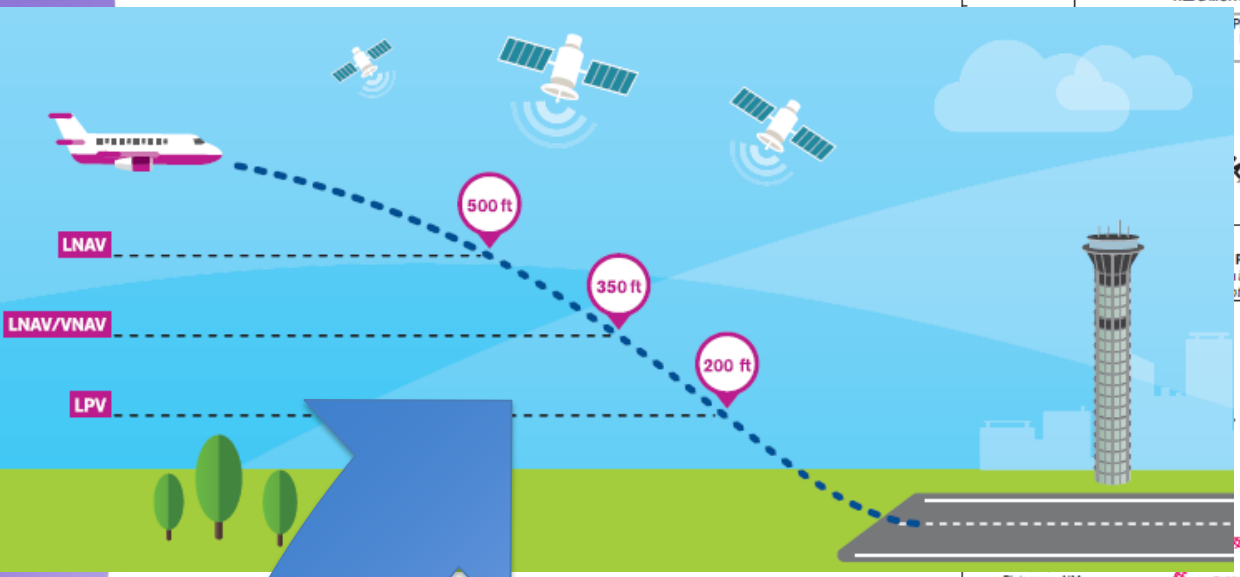
GPS ABAS minima

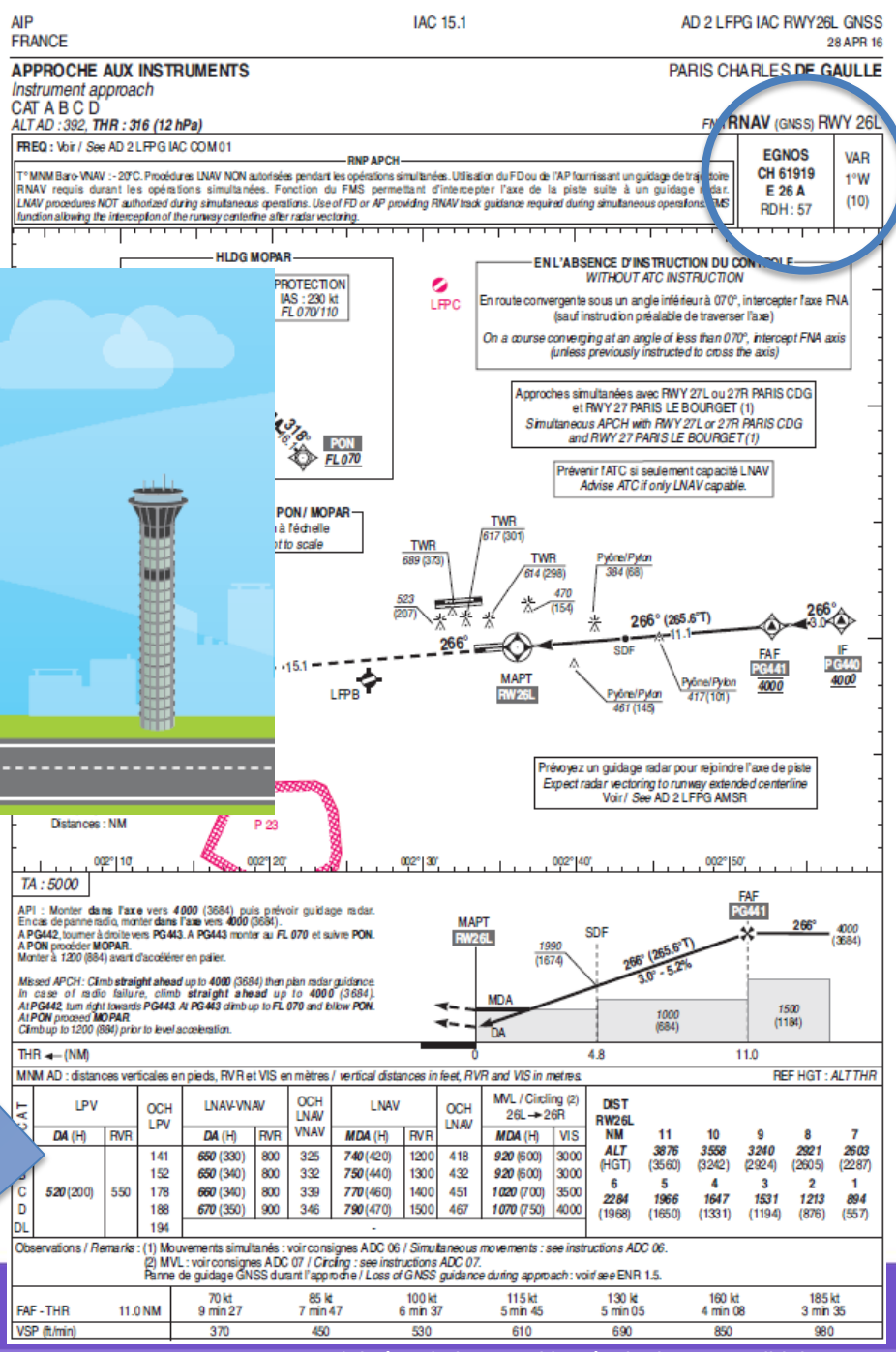


# EGNOS CAT I SERVICE

## PARIS CDG CHART



# EGNOS IS ….

# IN CONCLUSION, WHAT WE HAVE NOW IS:

# A COST EFFECTIVE BUT STILL PERFORMING NATIONAL APPROACH AND LANDING NETWORK:

- **The network aims to:**

**"Cat I everywhere, everytime"**

- **This is achieved through a mixed infrastructure**: **ILS and EGNOS**
  - When the ILS is out of service, or non existing over the runway in service, **equipped airlines benefit from an additional level of safety and airport accessibility thanks to EGNOS Cat I service**

- **Thanks to the PBN approach chart concept, this network is also accessible to airspace users not equipped with EGNOS**
  - **In particular GPS and BaroVNAV ABAS equipped users**
  - They use the same network, while ILS are maintained over the main airports
  - Acquisition of EGNOS avionics to access airports out of the ILS MON network is a case by case airspace user business case decision

# Merci !