

# CONTINUOUS DESCENTS

**ZERO STEP GOAL**



Delphine Guerin  
Kim Heap  
Adrien Emeraux  
Pierre Johnson

*FABEC VFE 2021*  
*December 7th 2021*



This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No **101017678**

# AGENDA

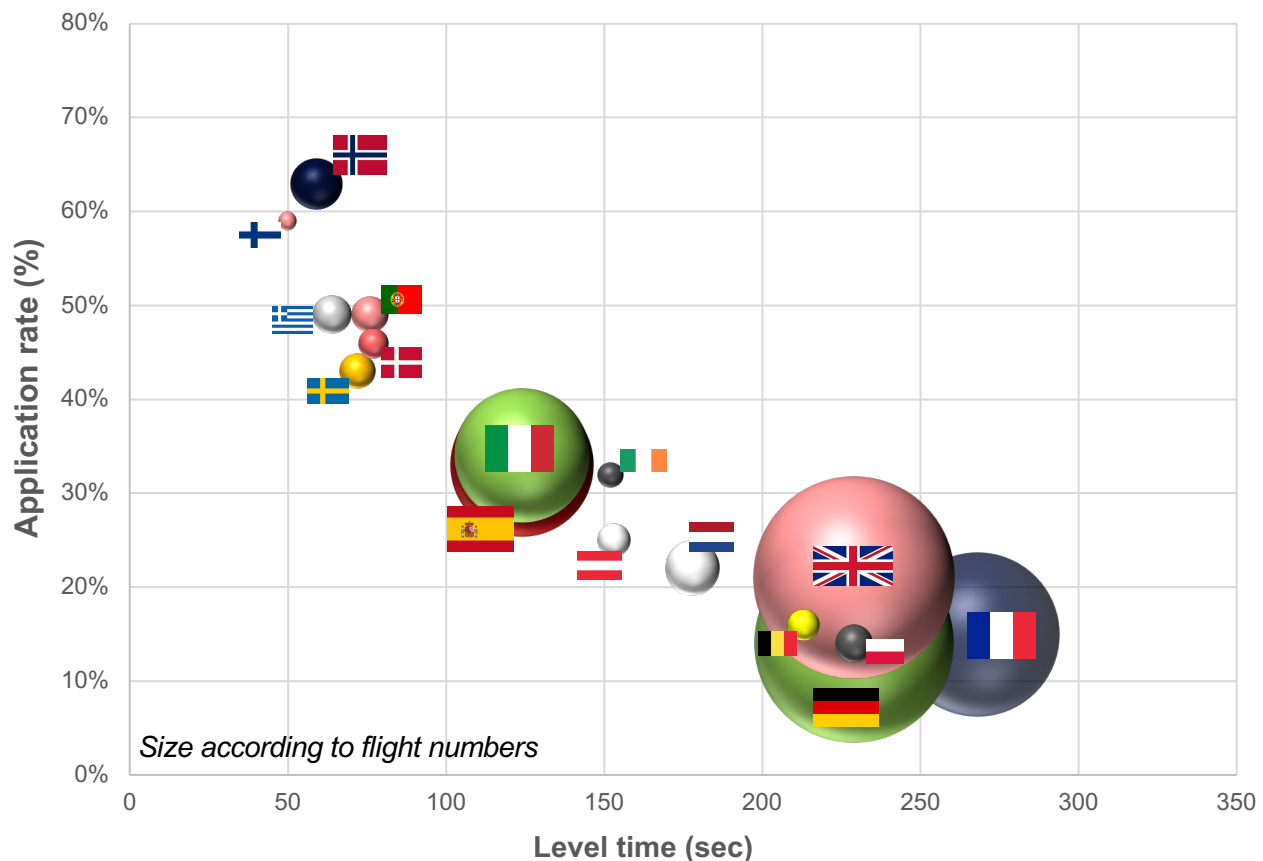
---

1. CDO SITUATION IN FRANCE
2. STEP BENEFITS
3. CDG CDO FOCUS
4. CDG LOA TRIALS
5. CONCLUSION

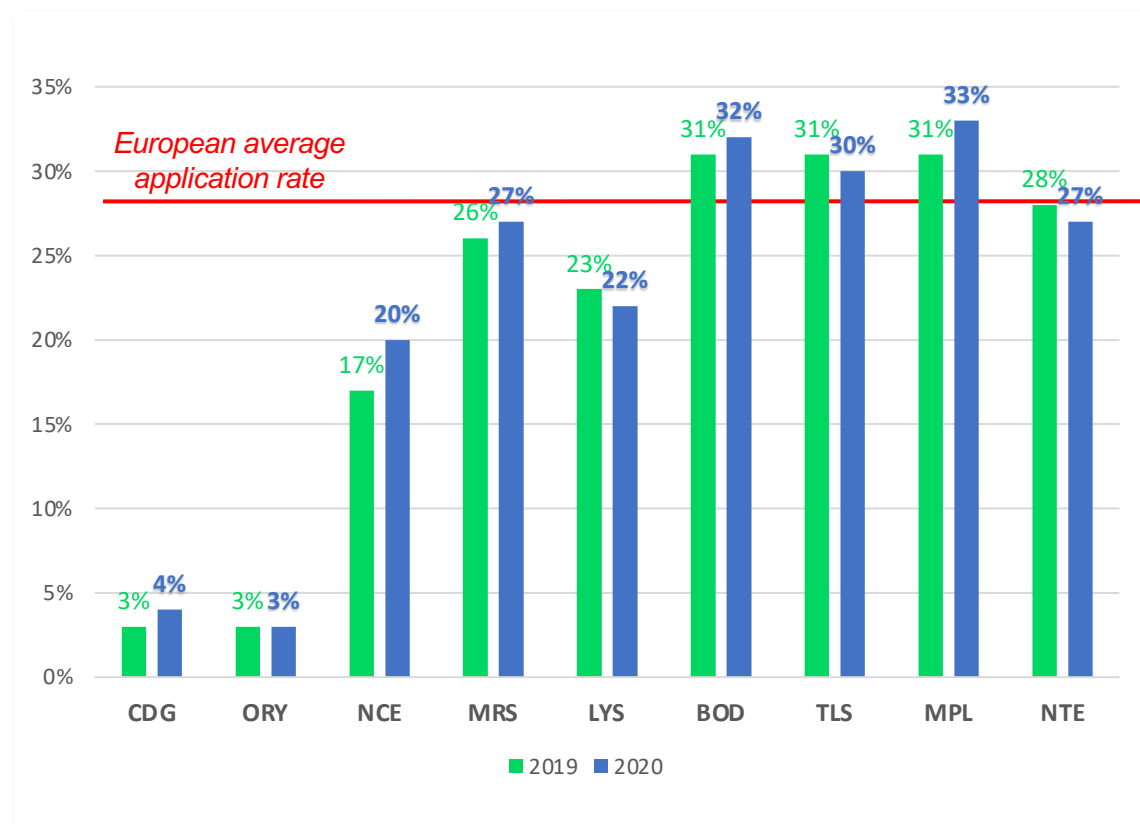


# 01 CDO SITUATION IN FRANCE

## CDO application rate and level time per country in 2019

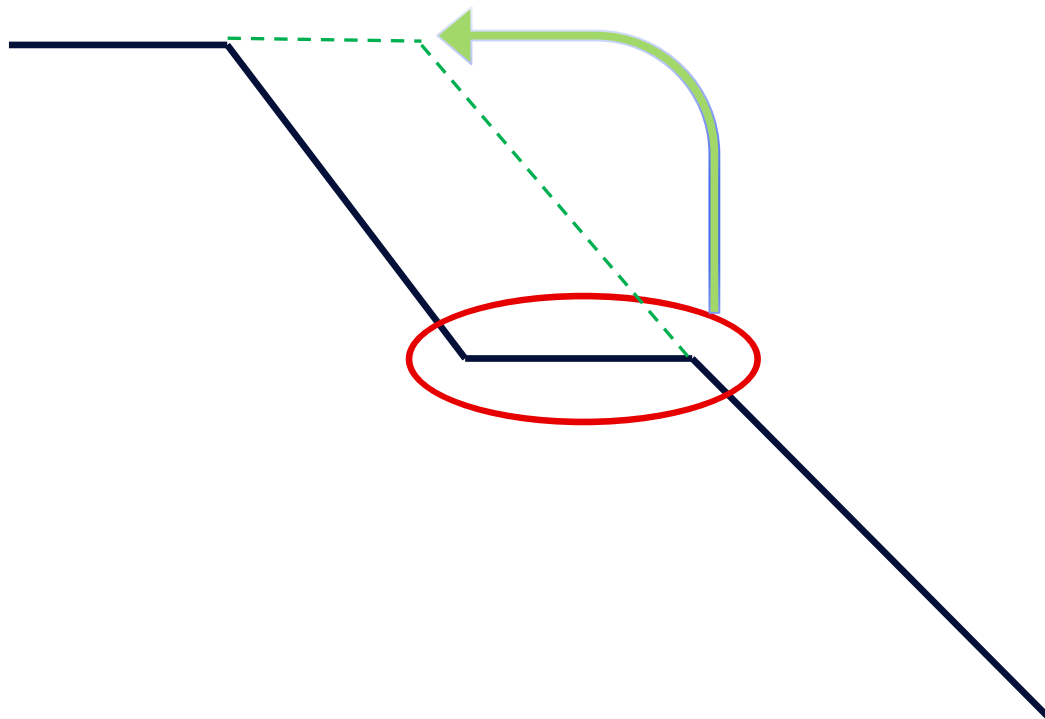


## CDO application rate 2019 vs 2020



# 02 STEP BENEFITS

Step analysis is only a part of the global descent studies. Reducing steps is a strong vector to optimise the descent phase. What are the savings ?



----- Optimized trajectory  
————— Observed trajectory

- TOD shift is the major factor linked with steps
- Distances flown at intermediate FL compared to cruise FL
- ⇒  $\Delta$  TAS
- ⇒  $\Delta$  Consumption # Z
- Flight time benefits
- Noise reduction

More time spent at cruise =

- + Faster
- + Optimized
- + Greener

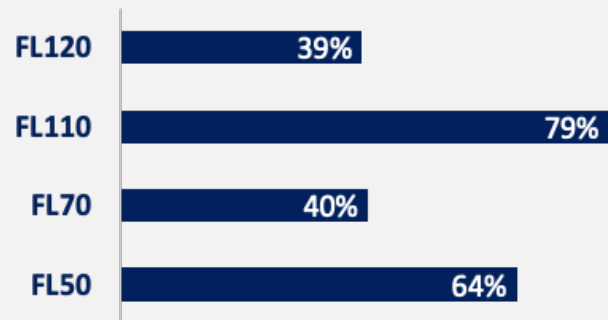


# 03 CDG CDO FOCUS

## Arrivals characteristics and step benefits – CDG 2019

### via MOPAR\*

- Step/FL distribution :



- Average step ground distance :

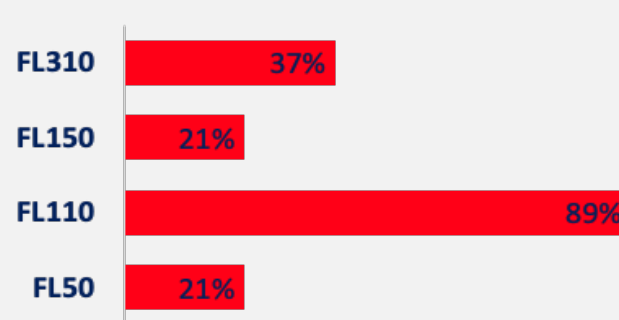
**42** NM

- Average step time :

**8** MIN

### via LORNI\*

- Step/FL distribution :



- Average step ground distance :

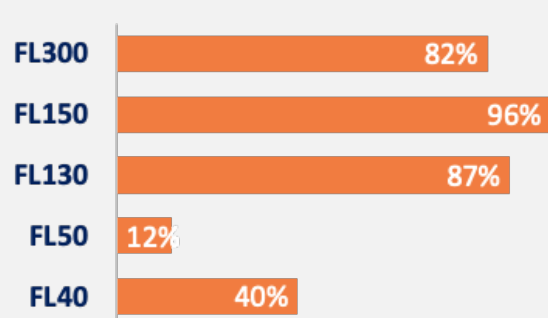
**35** NM

- Average step time :

**7** MIN

### via BANOX\*

- Step/FL distribution :



- Average step ground distance :

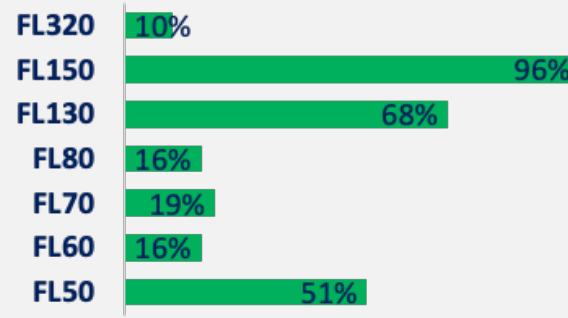
**56** NM

- Average step time :

**10** MIN

### via OKIPA\*

- Step/FL distribution :



- Average step ground distance :

**43** NM

- Average step time :

**7** MIN

## TOTAL CDG

- Average step ground distance (all approaches):

**32** NM

- Average step duration (all approaches):

**6** MIN

- 0 step savings (all approaches):

**10 000** T

**3400** flying hours

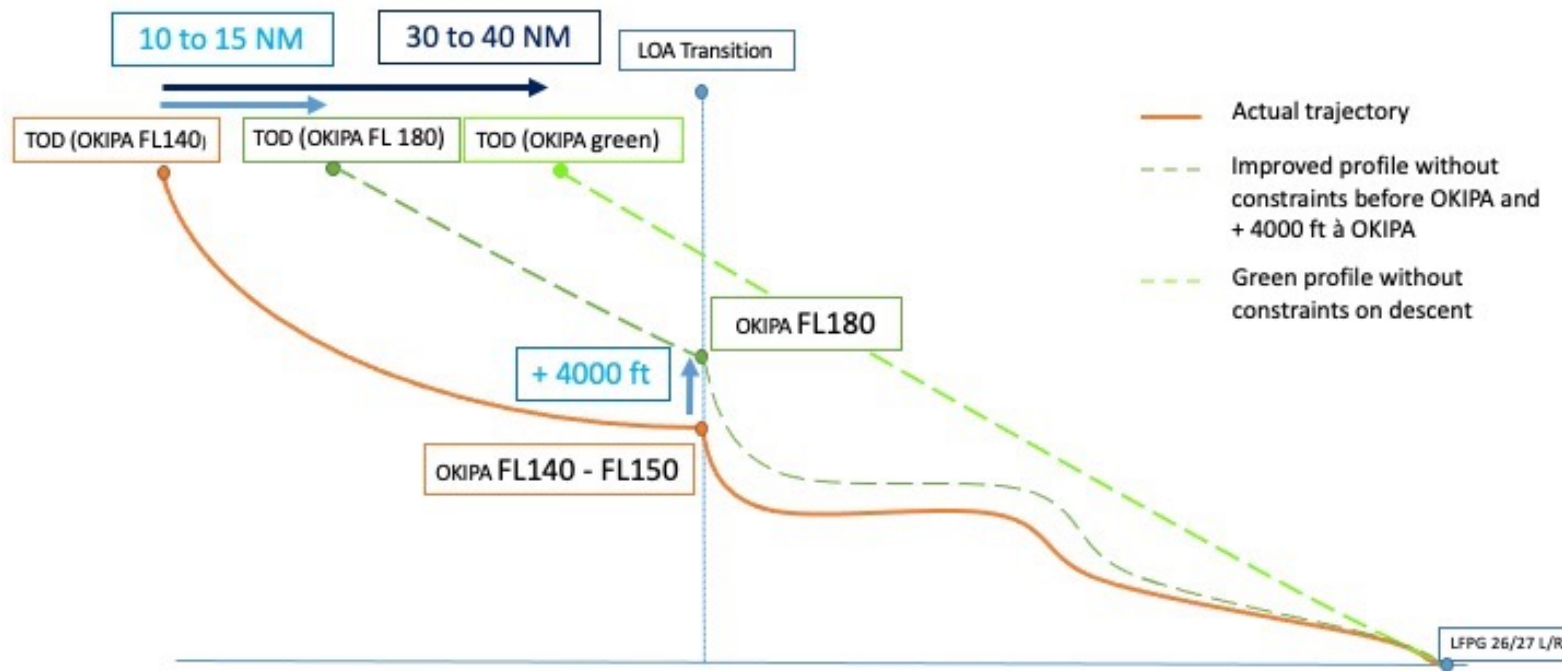
\* Downwind approach data: MOPAR/BANOX to rwy 26/27 and LORNI/OKIPA to rwy 08/09

# 04 CDG LOA TRIALS RESULTS

Improving LOAs (*Letter Of Agreement*) are efficient ways to optimize descents.

CDG's trials raised IAF's altitude up to 4000ft :

ALTITUDE CONSTRAINTS IMPACT ON DESCENT PROFILES



- Increasing OKIPA constraint by 4000ft leads to 10 to 15 NM TOD shift (if all others constraints upstream are cancelled).
- Trial benefits for a raise of + 4000 ft at OKIPA :



**90 to 400 kg / flight**  
(according aircraft type)



**280 to 1200 kg of CO2 / flight**  
(according aircraft type)



**1 to 2 minutes**



# 05 CONCLUSION

- Trials made possible thanks to ATC coordination between centers and collaboration between pilots and controllers in a context of low activity.  
Necessity to work on **long term implementation** – balance between capacity and optimization.
- Best performance : descent optimization information communicated to pilots before TOD.
- Prerequisite to share the same definitions, analysis (KPI) and phraseology about CDO while maintaining priority on flight safety.
- Trials results are **compliant** with regard to descent inefficiencies of 10 000 T and 3400 H in 2019 for Air France.
- Significant trial outcomes even if implemented on a low flow of daily traffic.
- Follow-up: coordination with ATC controllers to launch a new set of trials.

