

THALES

Building a future we can all trust



Dynamic Collaboration to Generalize Eco-friendly Trajectories

THALES / FRACS

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THA



Speakers



David ANTONELLO

Green Operations Project Leader
THALES Airspace Mobility Solutions

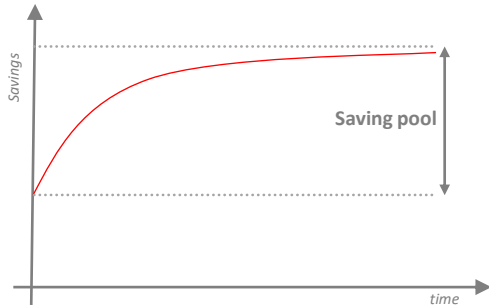


Farid ZIZI

Director
France Aviation Civile Services (FRACS)

Environmental Transition of operations is a **process**

1. Permanently evaluate the environmental footprint of each actor



3. Experiment locally to assess benefits



4. Large scale deployment if viable



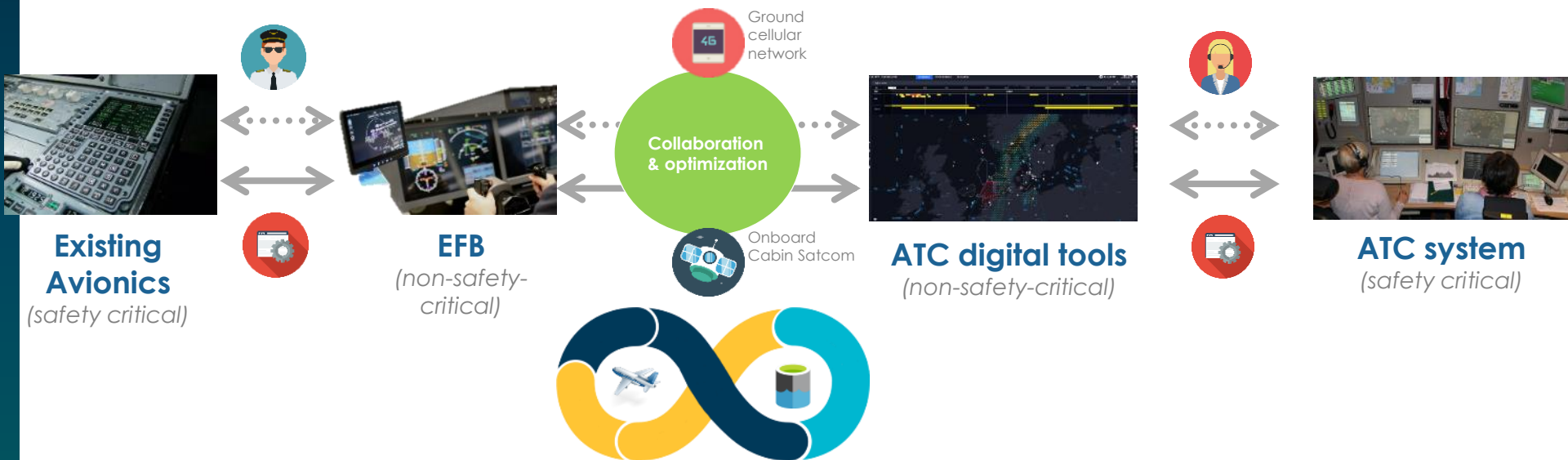
2. Explore new ground / flight optimization strategies



Exploring with **local ecosystems** (ANSP, airlines...)
how to develop **innovative approaches** to implement these savings **fast**

Act fast through **New Strategies & Concepts**

MERGING KNOWLEDGE AND INTENTIONS FROM DIFFERENT PERSPECTIVES THANKS TO AN ENHANCED COLLABORATION



Using digital tools allows to ease **experiment & deployment** to **existing** aircraft and control centers

Execute more Eco Friendly Operations : **Step by Step**



STEP 0 (21)

Explore new Strategies

- Objectives
 - Find new operational concept
→ **Green Flag**
- Optimizations
 - Identify dedicated time slots where ATC constraints could be temporarily reduced
- Area
 - all
- Representativity
 - low, for ideation purpose

The GREEN FLAG Concept

- To set up an ATM / Airline cooperative process & associated digital tools to maximize the use of Eco-Friendly procedures
- To identify dedicated time slots where ATC constraints could be temporarily reduced
- To coordinate the Green intentions from different stakeholders
- To design a concept applicable on daily operations optimizing the environmental performance at traffic flow level

TO EXECUTE MORE ECO FRIENDLY PROCEDURES

Execute more Eco Friendly Operations : **Step by Step**



STEP 0 (21)

Explore new Strategies



STEP 1 (S1 22)

Live Experimentation

Objectives

- Find new operational concept
→ Green Flag
- Assess feasibility to deploy Green Flag in operations

Optimizations

- Identify dedicated time slots where ATC constraints could be temporarily reduced
- CDO
- TOD optim
- CFL optim

Area

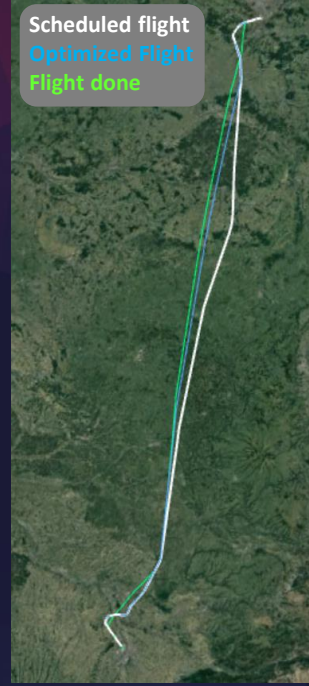
- all
- Flights Paris -> Toulouse
- CRNA Bordeaux + approach centre Toulouse

Representativity

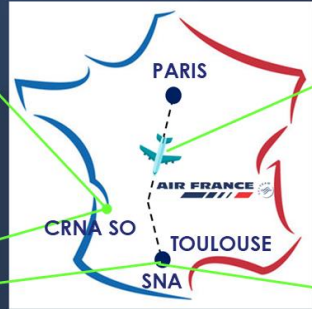
- low, for ideation purpose
- 2x Live Flights (Air France)

Step 1: Live Experimentation

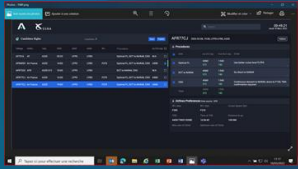
Scheduled flight
Optimized Flight
Flight done



Pilot EFB Green Flag interface



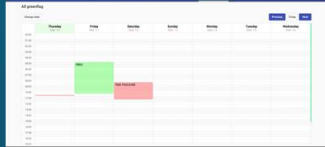
Approach Controller Green Flag Interface



FMP Green Flag Interface



ATCO Tablet



Green Flag Slots Publication Interface

OPTIMIZED CRUISE FL

DIRECT TO INITIAL APPROACH FIX

OPTIMIZED TOP OF DESCENT

CDO to Toulouse Airport

Execute more Eco Friendly Operations : **Step by Step**



STEP 0 (21) *Explore new Strategies*



STEP 1 (S1 22) *Live Experimentation*



STEP 2 (S2 22) *Play Time Simulation*

Objectives	<ul style="list-style-type: none">• Find new operational concept → Green Flag	<ul style="list-style-type: none">• Assess feasibility to deploy Green Flag in operations	<ul style="list-style-type: none">• Simulation to estimate CO2 savings• Identify flights with highest savings
Optimizations	<ul style="list-style-type: none">• Identify dedicated time slots where ATC constraints could be temporarily reduced	<ul style="list-style-type: none">• CDO• TOD optim• CFL optim	<ul style="list-style-type: none">• CFL optim via RAD removal• Descent profile optim via LOA removal• TOD optim
Area	<ul style="list-style-type: none">• all	<ul style="list-style-type: none">• Flights Paris -> Toulouse• CRNA Bordeaux + approach centre Toulouse	<ul style="list-style-type: none">• 35% of Marseille FIR
Representativity	<ul style="list-style-type: none">• low, for ideation purpose	<ul style="list-style-type: none">• 2x Live Flights (Air France)	<ul style="list-style-type: none">• Play Time Simulation• 5 000 flights (2019)• 3 typical days (low/medium/high traffic)

Step 2: Play Time Simulation

Analysis done on 35% of the Marseille FIR, 5 000 Flights



THALES Simulation Lab

3 Concepts

- CFL optim via RAD removal
- Descent profile optim via LOA removal
- TOD Optim

18% of air traffic in Marseille FIR

→ non optimized CFL due to RAD restrictions

15% of air traffic in Marseille FIR

→ non optimized descent profile due to LOA restrictions

90% of air traffic in Marseille FIR

→ non optimized TOD

4% of achievable emissions reduction in average per flight

Up to 12% of achievable emissions reduction for some A/C

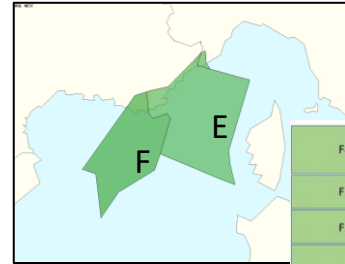
FRACS ROLE IN THE PLAY TIME SIMULATION

Gather the Traffic Samples

2019 –Marseille ACC
 High: 01/09/2019
 Medium: 04/06/2019
 Low: 30/12/2019

Analyse Traffic Samples
 Select Traffic Situations
 Prepare Business Trajectories

Prepare Live Simulation Exercises



F4	UNL FL375	E3	UNL FL355
F3	FL375 FL355		
F2	FL355 FL335	E2	FL355 FL305
F1	FL335 FL245	E1	FL305 FL245



2^{ème} date: 1^{er} septembre 2019

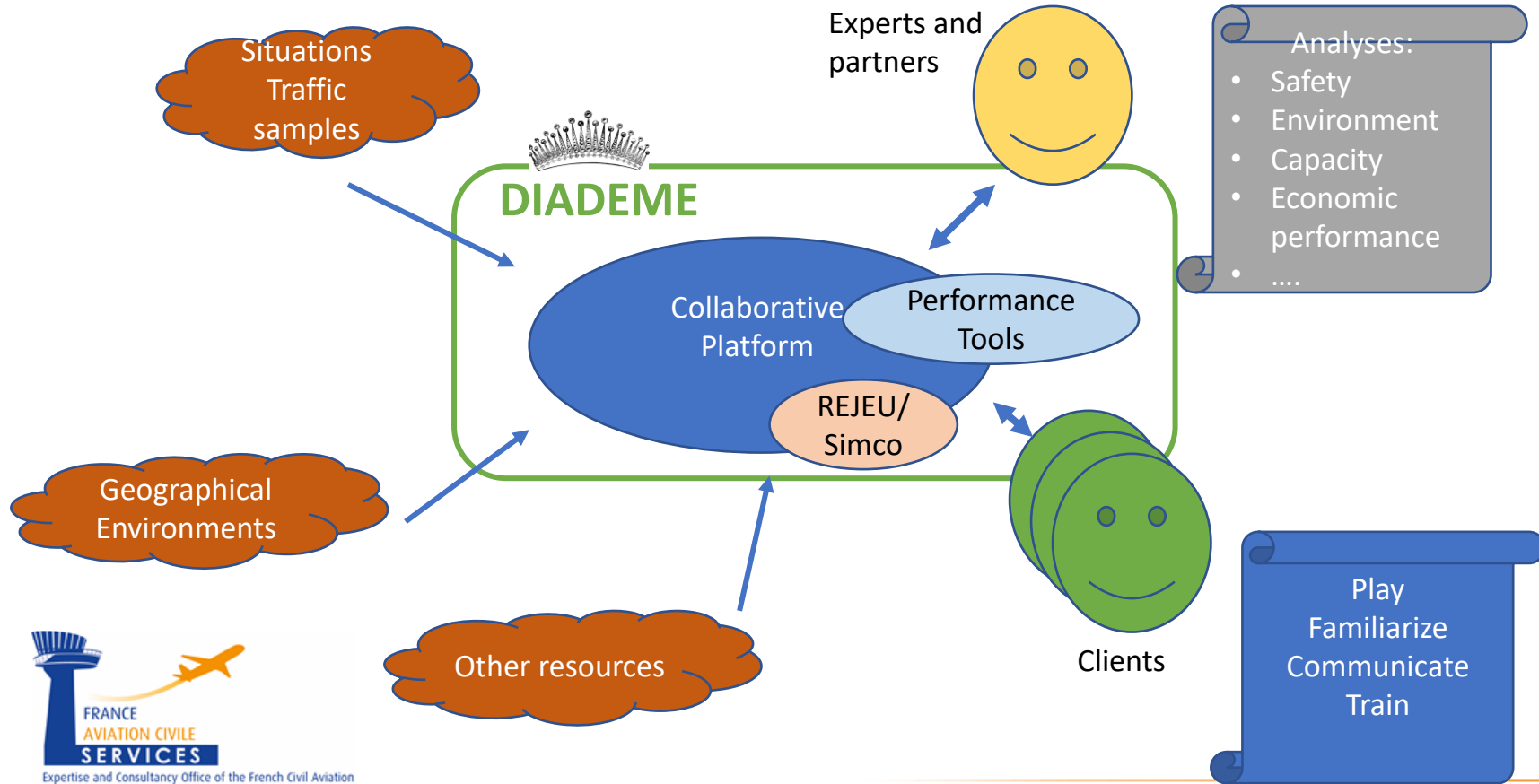
Bloc E: Regroupements et quantité de trafic réalisée



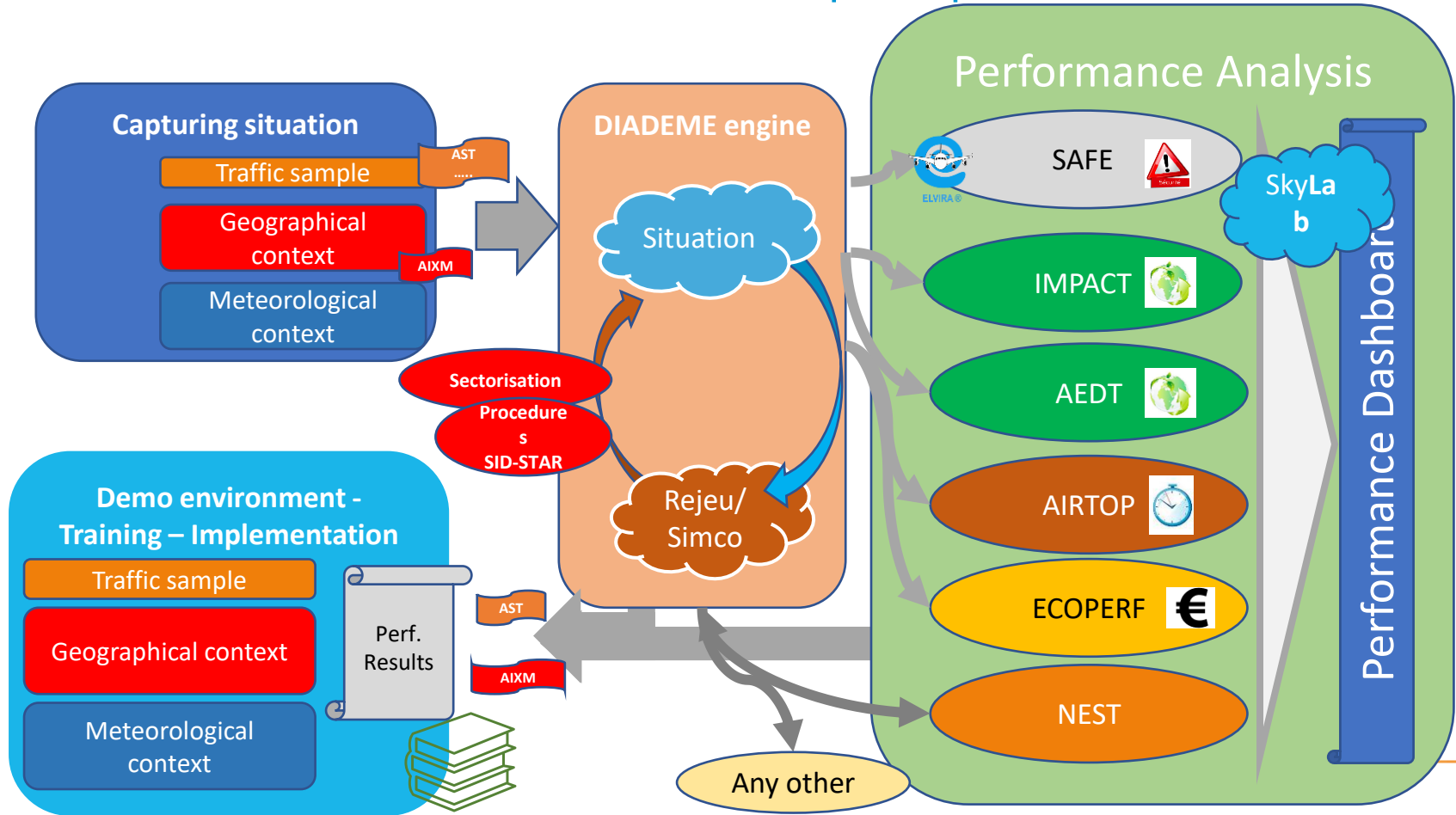
PREPARING AND PLAYING SIMULATIONS



Collaboration between experts, partners and clients of an airspace design project



Using DSNA tools and streamlining work from traffic sample to performance dashboard



How it was Played ?

09:02:11

07:19:50 **6** 10:23:44

Predefined Times

09:00:00 14:00:00
15:10:00 16:30:00

G L I U

Traffic File

Save

Icons: Search, Radar, Alert, etc.

CSV TARGET FL

I M E I N

Sectors

0 500

E3 K3

Drop File or Click

Capturing situation

Traffic sample **AST**

Geographical context **STP**

DIADEME engine

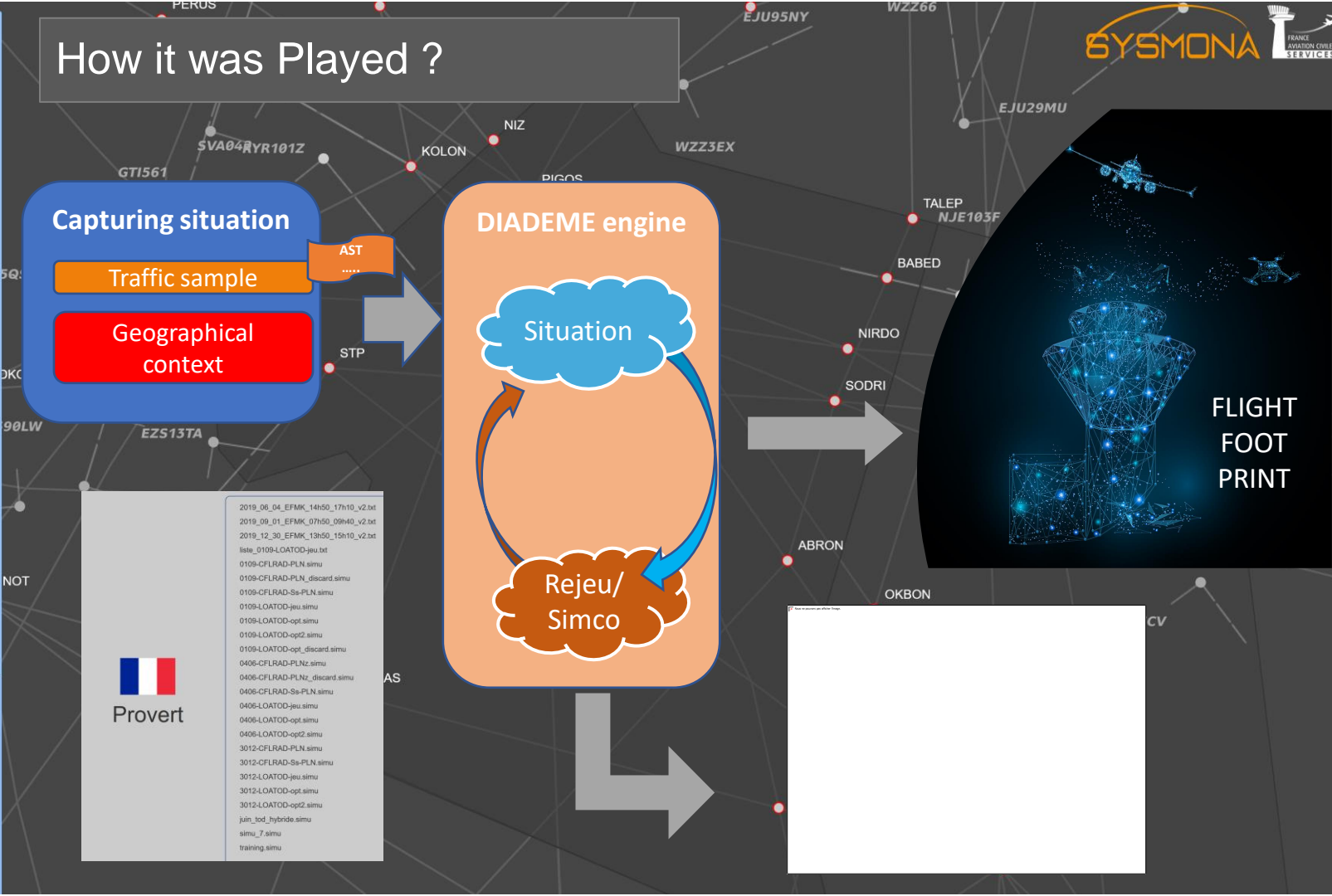
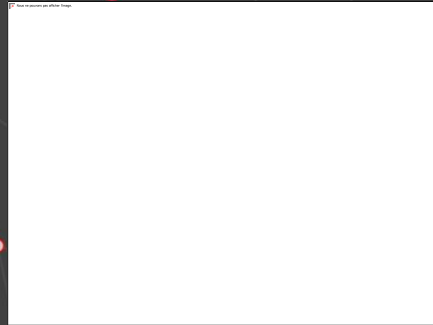
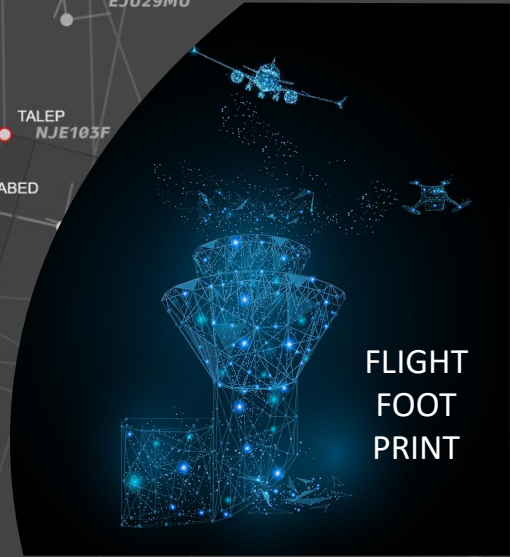
Situation

Rejeu/Simco

Provert

```

2019_06_04_EFMK_14h50_17h10_v2.txt
2019_09_01_EFMK_07h50_09h40_v2.txt
2019_12_30_EFMK_13h50_15h10_v2.txt
liste_0109-LOATOD-jeu.txt
0109-CFLRAD-PLN.simu
0109-CFLRAD-PLN_discard.simu
0109-CFLRAD-Sa-PLN.simu
0108-LOATOD-jeu.simu
0109-LOATOD-opt.simu
0109-LOATOD-opt2.simu
0109-LOATOD-opt_discard.simu
0406-CFLRAD-PLNz.simu
0406-CFLRAD-PLNz_discard.simu
0406-CFLRAD-Sa-PLN.simu
0406-LOATOD-jeu.simu
0406-LOATOD-opt.simu
0406-LOATOD-opt2.simu
3012-CFLRAD-PLN.simu
3012-CFLRAD-Sa-PLN.simu
3012-LOATOD-jeu.simu
3012-LOATOD-opt.simu
3012-LOATOD-opt2.simu
juin_tod_hybride.simu
simu_7.simu
training.simu
    
```



Execute more Eco Friendly Operations : **Step by Step**



STEP 0 (21) *Explore new Strategies*



STEP 1 (S1 22) *Live Experimentation*



STEP 2 (S2 22) *Play Time Simulation*



STEP 3 (23) *Shadow mode / Large scale*

Objectives

- Find new operational concept
→ Green Flag
- Assess feasibility to deploy Green Flag in operations
- Simulation to estimate CO2 savings
- Identify flights with highest savings
- Deploy at European scale
- Simulation of new area
- Cooperation with the NM

Optimizations

- Identify dedicated time slots where ATC constraints could be temporarily reduced
- CDO
- TOD optim
- CFL optim
- CFL optim via RAD removal
- Descent profile optim via LOA removal
- TOD optim
- Extend the portfolio of optimizations

Area

- all
- Flights Paris -> Toulouse
- CRNA Bordeaux + approach centre Toulouse
- 35% of Marseille FIR
- European scale

Representativity

- low, for ideation purpose
- 2x Live Flights (Air France)
- Play Time Simulation
- 5 000 flights (2019)
- 3 typical days (low/medium/high traffic)
- Shadow mode

CONCLUSION

Some Flight Path optimization can be achieved right from now !