Enabling Environmentally Friendly Approach Profiles DYNCAT

Dynamic Configuration Adjustment in the TMA

Dr. Fethi Abdelmoula, Tobias Bauer
DLR, Institute of Flight Systems, Braunschweig, Germany

SESAR JU webinar on Green ATM - greener arrivals and departures,
4th December 2020

Hosted by

Agenda

- Observations & Motivation
- Technical Background
- Project Concept and Methodology
- Expected Results

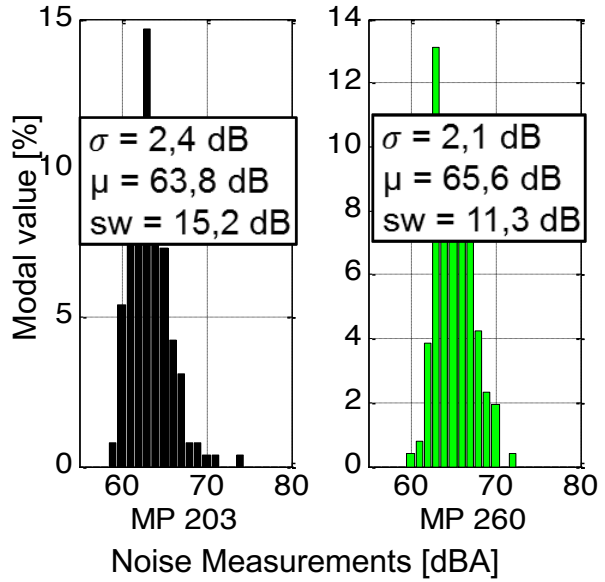
This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 893568

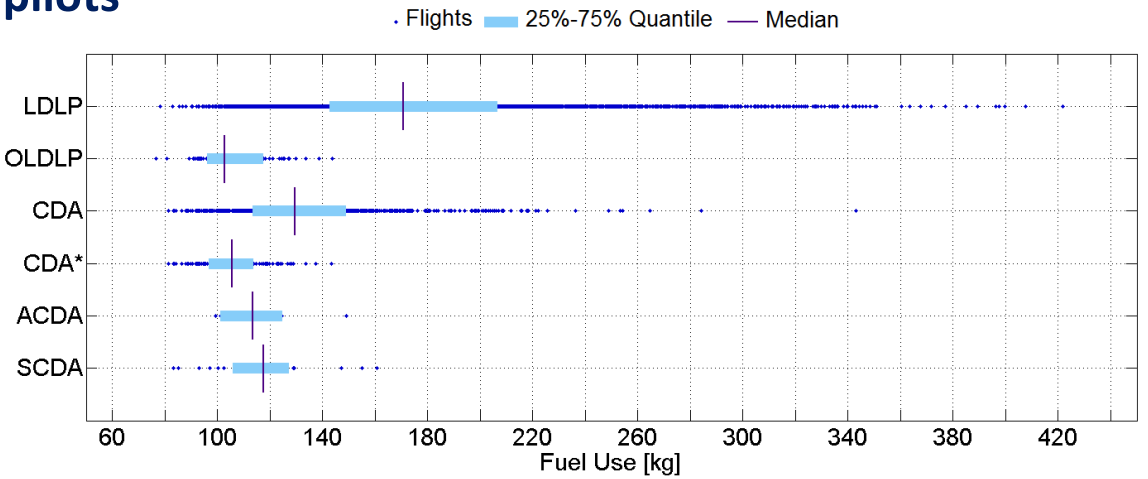
Observations & Motivation

- The noise generated by airplanes in approach significantly exceeds in practice the levels that could be reached *while flying exactly the same 3D-trajectory*.
- Optimal energy management by changes of speed, altitude, and with wind effects proves to be challenging for a pilot and with the current indications in the cockpit
  - **Often conservative strategies are adopted by the pilots**
    - **Safe but loud…**
    - **Limited energy awareness**
    - **Increased fuel consumption**

What is the reason for such huge variations?
What were the differences between these approaches?

- The environmental conditions and the requirements of air traffic control make every approach unique





Fuel consumption from 30 NM to 1000 ft Gate

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 893568

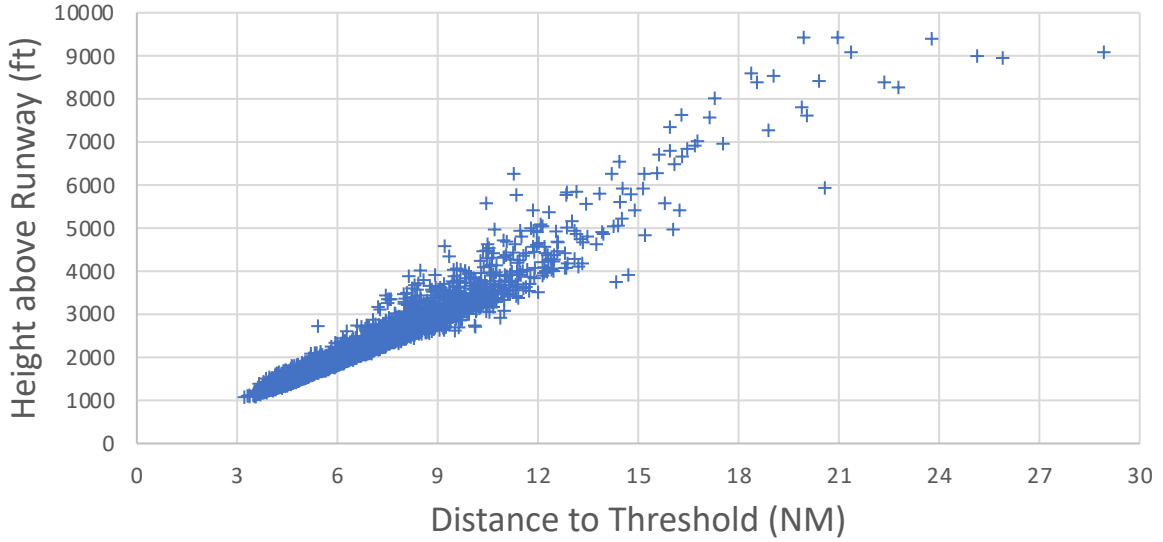
Observations & Motivation

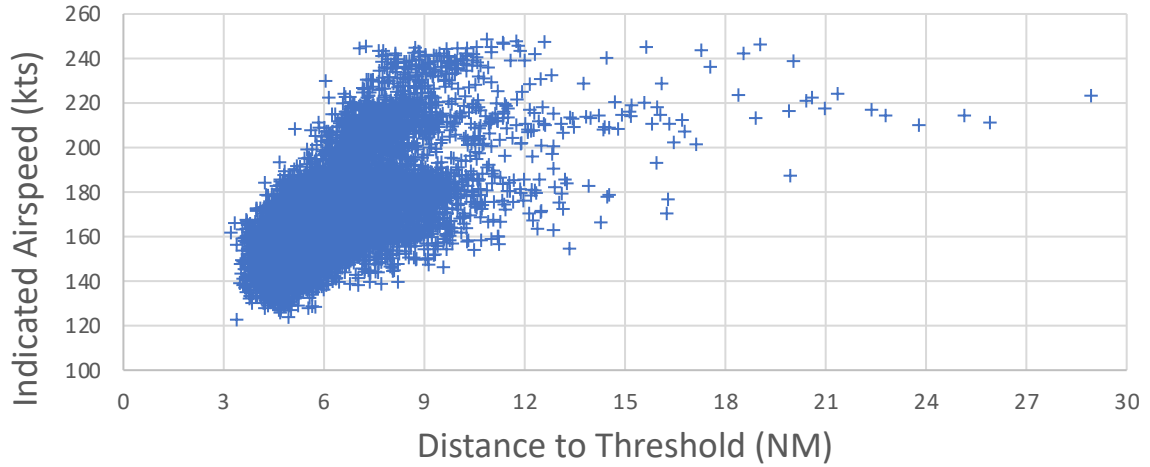
Analysis of current daily operations

Flight Data: Position of landing gear extension and related speed

Example: Zurich RWY 14 ‚Extending landing gear‘ (lever, A320)

- About 12794 approaches evaluated: landing gear extension from 30 NM and 10000 ft
- 7% at 8 NM or more from the runway threshold
- Significant variation of
  - **Speed management**
  - **Landing gear extension**





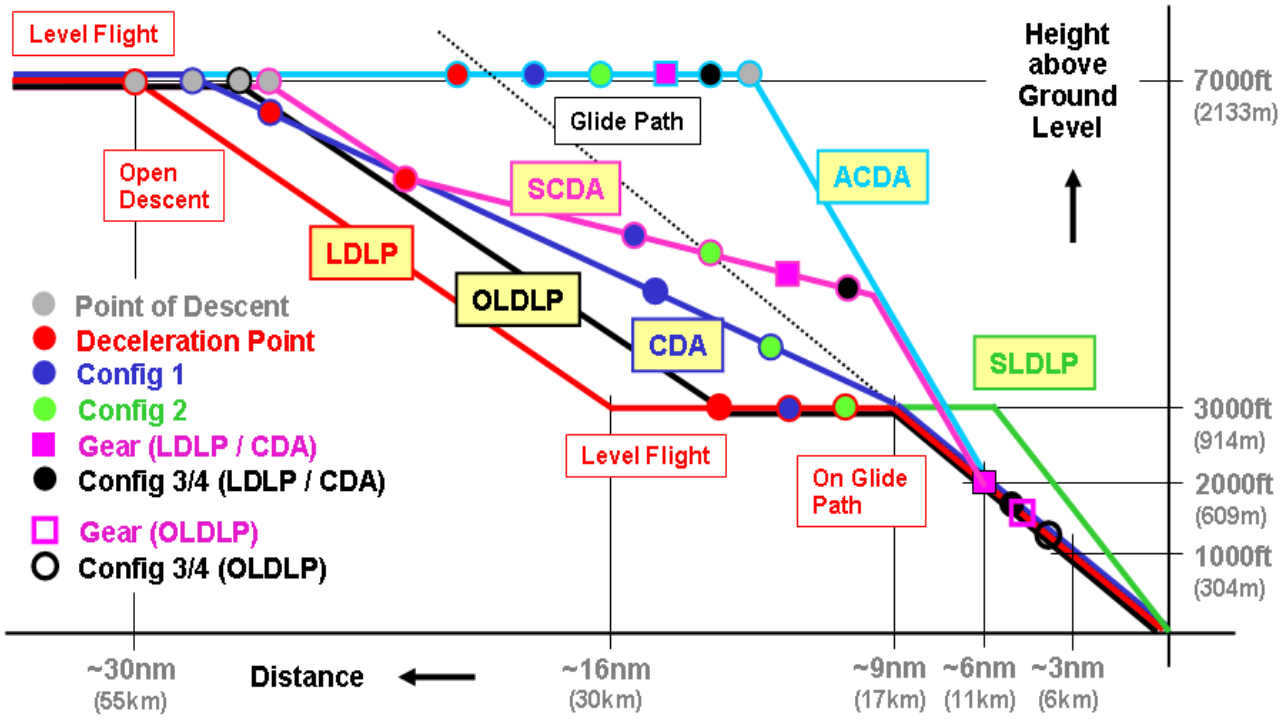
This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 893568

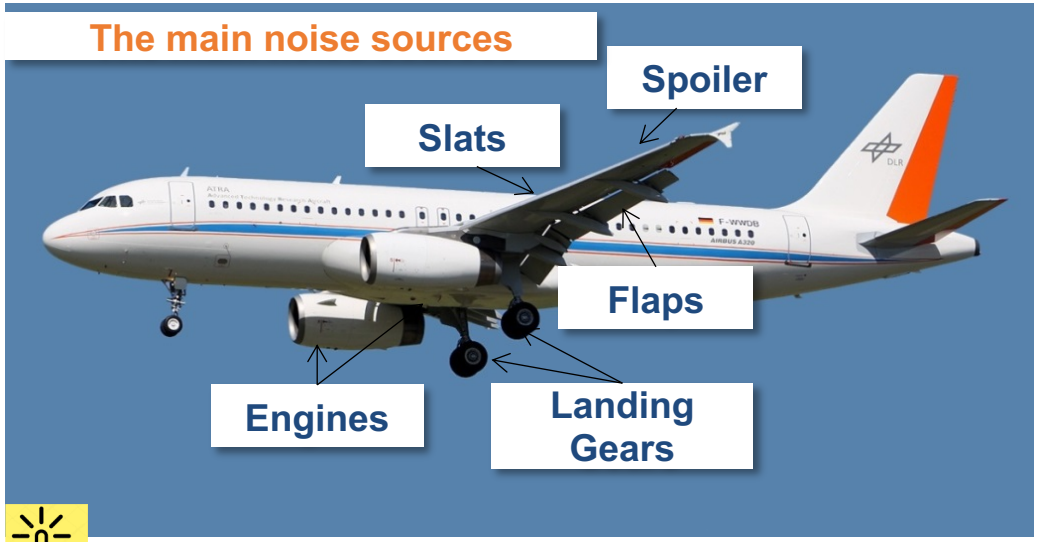
Background

Approach Procedures

Continuous Descent Approach (CDA)
Advanced Continuous Descent Approach (ACDA)
Segmented Continuous Descent Approach (SCDA)

Low Drag Low Power (LDLP)
Optimized LDLP (OLDLP)
Steep LDLP (SLDLP)





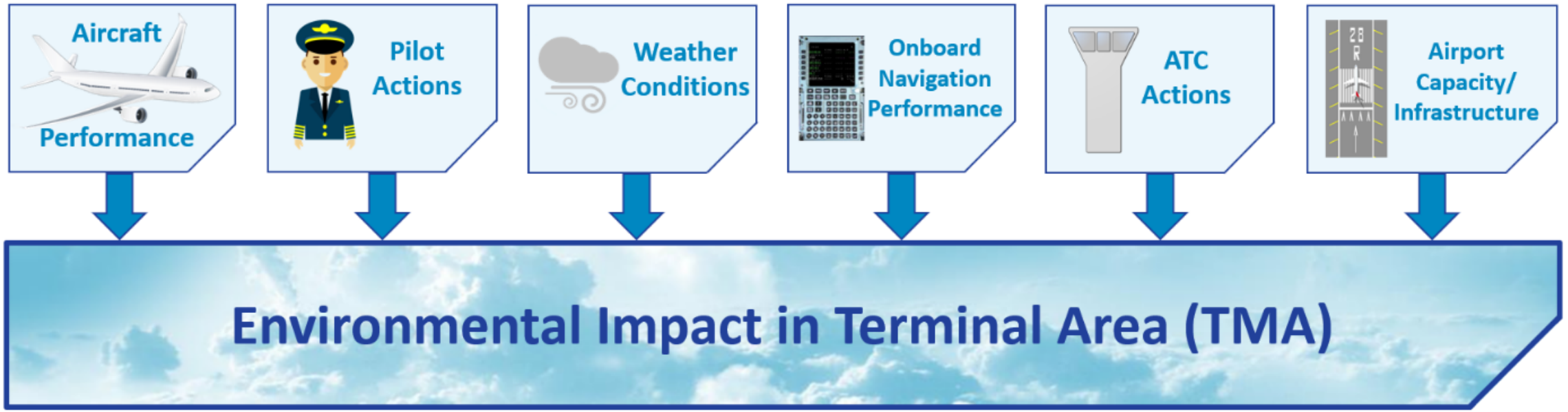
- *The pilot also intervenes indirectly in speed management during approaches supported by autopilots.*
- *The speed setpoints are determined automatically, but are dependent on the currently selected flap configuration, which is still determined by the pilot himself.*
- *Landing gears are also controlled manually by the pilots.*

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 893568

Background

Air Traffic Operation

What are the main impact drivers of the current air traffic operations on the environment in the TMA?

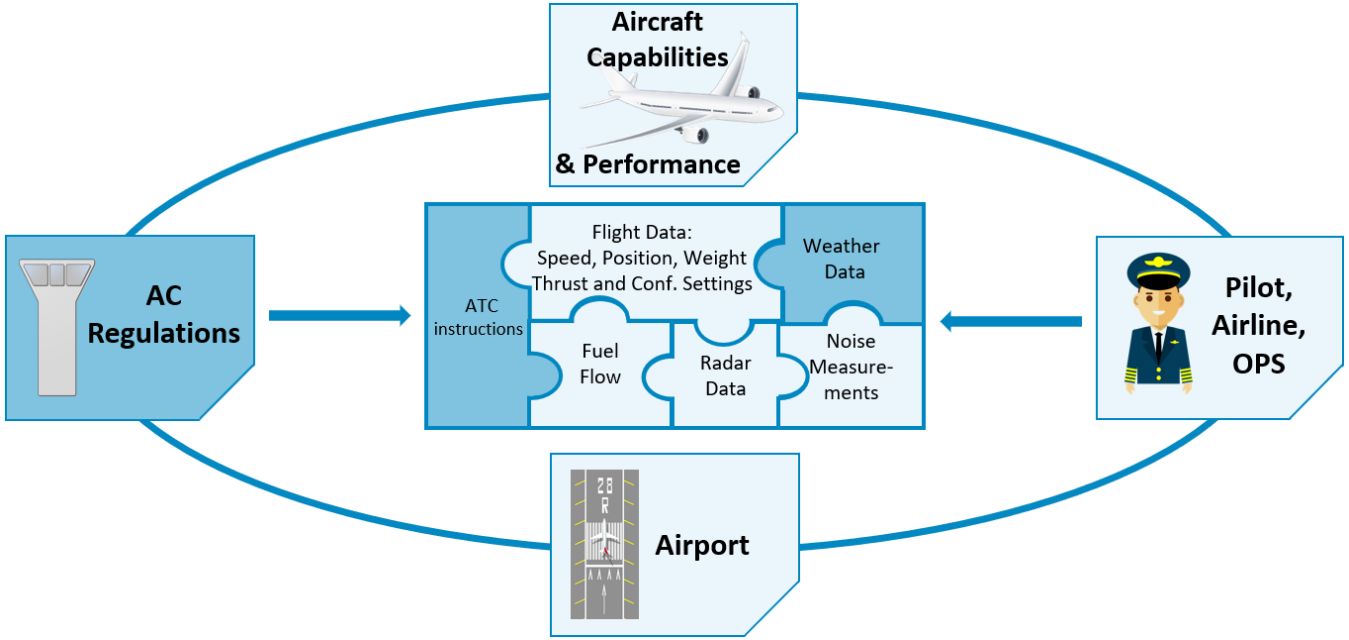


This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 893568

DYNCAT Concept and Methodology

Visualize and measure the influence of ATC

with *input from practitioners (pilots, ATCos) and authorities* throughout the project



analysis of combined real-world data from all relevant sources

↓

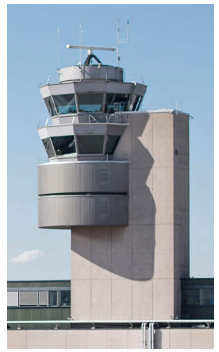
definition of operational concept

↓

prototyping of DYNCAT algorithms into FMS demonstrator on industrial test bench

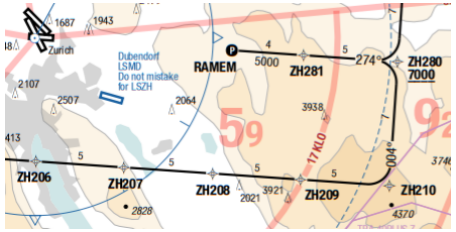
↓

evaluation / quantification



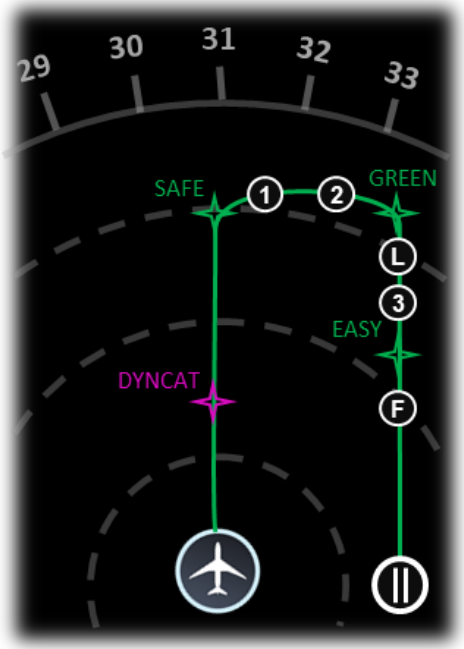
This project has received funding from the SESAR Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 893568

Expected Results



In this project, pilots, air traffic control and industry are working intensively with the research facilities to present a global picture:

- a series of **categorized and prioritized recommendations and solutions** in form of a **catalogue of measures.**
  - **see the impact e.g. of speed restrictions and what measures ATM can take to minimize negative influences.**
  - **suggestions and recommendations for innovative operational changes to ATM aiming at reducing the environmental impact from aviation**
  - **definition of requirements aimed at developing 4D trajectories that are optimised to take account of environmental considerations**
  - **suggestions for improvement for pilot training**
  - **recommendations for flight procedure designer and authorities**
  - **recommendations for equipment and aircraft manufacturers**



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 893568

Thanks for your attention !

Questions ?

Dr. Fethi Abdelmoula
E-Mail: Fethi.Abdelmoula@dlr.de

Tobias Bauer
E-Mail: Tobias.Bauer@dlr.de

Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)
German Aerospace Center
Institute of Flight Systems | Flight Dynamics and Simulation
Lilienthalplatz 7 | 38108 Braunschweig | Germany

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 893568

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 893568

Further information about the DYNCAT project on the SESAR website: https://www.sesarju.eu/projects/dyncat
Additional technical information: https://www.dyncat.eu and https://www.skylab.swiss/dynamic-configuration-adjustment-in-the-tma-dyncat/