



## PROJECT MOTIVATION

Pilots should have on board a better understanding of the stakes of the current mission from the perspective of the airlines objectives. During a flight, when a change in the operational conditions arises, different alternative trajectories can be computed with dedicated optimisation or prediction systems. These systems usually produce trajectories with trade-offs between expected fuel usage and delay. The pilot, or the dispatcher, considers these expected values in order to decide how to tactically operate the aircraft. This approach has several challenges:

- Arrival delay needs to be translated into parameters which are relevant for the airlines (on-time performance and cost).
- Uncertainties need to be estimated (e.g., holding time at arrival).
- The crew faces a multi-criteria decision process as different objectives (cost, on-time performance), and constraints are considered.

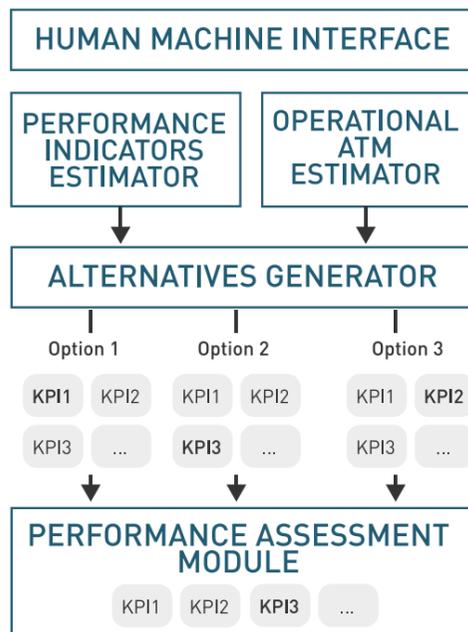
The use of prior to the flight estimations, such as the cost index of the operational flight plan, might not be relevant at the moment of reassessing the flight, as the situation has evolved.

## MAIN R&D OBJECTIVES

Pilot3 will develop a software engine model to support crew with alternative **trajectories** by performing a **multi-objective optimisation** combining:

- Explicit estimation of key performance indicators
- Estimation of ATM operational parameters

## PILOT3 ARCHITECTURE



### Alternatives Generator

Computes the different alternatives to be considered by the pilot; fed by two independent sub-systems.

### Performance Indicators Estimator

Computes the expected impact of each solution for the different performance indicators relevant to the airline with heuristics or advanced machine learning techniques.

### Operational ATM Estimator

Estimates operational aspects which impact the trajectory and the actual in-block time, such as tactical route amendments, expected arrival procedure, holding time, distance flown in terminal airspace due to arrival sequencing and merging operations, and taxi-in time.

### Performance Assessment Module

Considering the expected results of each alternative on different KPIs, it filters and ranks them according to airlines and pilots preferences.

### Human Machine Interface

Presents the alternatives to the pilot and allows them to interact with the system, e.g., adding constraints.

## OBJECTIVES CONSIDERED

Pilot3 will explicitly estimate the impact of different trajectories on two objectives (making redundant the use of cost index as a proxy):

### Cost

- ◆ **Cost of fuel**
- ◆ **Cost of passenger disruptions** (IROPs),
- ◆ **Other costs** (reactionary delay costs, curfew infringement costs, maintenance and crew costs)

### On-Time Performance

### PILOT3: Innovative Action within CleanSky 2 programme

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