



# Maintenance Optimization in the Airline Industry

## - Master 2 Optimization Research Internship -

### Context

DecisionBrain is a high-tech company that combines Optimization, Machine Learning and Artificial Intelligence to create innovative decision-support solutions that drive operational productivity and efficiency.

The internship will take place in our offices in Paris (10e) or Montpellier (Millénaire).

### Subject

DecisionBrain is implementing a library to optimally plan the maintenance of a fleet of airplanes over a period of 5+ years. The size of the fleet can vary from 10 to 100 or more airplanes.

An airplane is made of different assemblies, the most important ones are the airframe, the engines, the auxiliary power unit (APU), the landing gear.

As the assembly with the highest impact on the maintenance costs is the engine, the focus will be set on the maintenance of the engines.

During its life, an engine has to undertake different maintenance visits during which some of its components will be replaced. To undertake maintenance, an engine is removed from the airplane and sent to a maintenance shop. Duration of the maintenance is typically 2-3 months. During that time, a spare engine will be installed on the airplane to fulfill the commercial plan.

Typically, an airline company has 10% of spare engines that can be used to replace an engine during a maintenance visit.

An airplane can be either owned by the airline company or leased. When leased, the airplane and the engines are leased for an agreed period of time. When return to the lessor, the airplane and its engine must be returned with a minimum number of flight hours. There is also lease return costs that depend on the number of flight hours done since the last maintenance visit.

The objective of the optimization model is to build an optimal maintenance plan that minimizes the maintenance costs and the lease costs.

As the optimization problem is quite large, an exact optimization model cannot be applied. The aim of the internship is to design and implement heuristics and decomposition procedures to complement the exact method approach and improve performance.

The first part of the internship will be to do a state of the art in maintenance optimization in the field of the airline industry.

The second part of the internship will be to propose and implement heuristics and decomposition algorithms and to compare the performance of these algorithms with an exact method.

Implementation of the heuristic algorithms and decomposition methods will be done in Java.

### **Skills Required**

The candidate should have the following skills:

- Good knowledge in Operation Research
- Good programming skills, preferably in Java.
- Good proficiency in English

Beyond technical skills, the candidate is expected to have some degree of autonomy and be able to collaborate efficiently with other team members.

Possibility to apply to a PhD thesis position in Operation Research at DecisionBrain after the internship

### **Submission**

The candidate can submit her/his application by sending to [careers@decisionbrain.com](mailto:careers@decisionbrain.com) and to [dauzere-peres@emse.fr](mailto:dauzere-peres@emse.fr) the following information:

- A curriculum vitae
- An introductory letter
- The master 1 and master 2 records & transcripts