

# On Air Traffic Flow Management Problem under uncertainty via Stochastic Programming

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## Abstract

We present a framework for solving large-scale multistage mixed 0–1 problems for the air traffic flow management problem with rerouting (ATFMRP) under uncertainty in the airport arrival and departures capacity, the air sector capacities and the flight demand. A scenario tree based scheme is used to represent the Deterministic Equivalent Model of the stochastic mixed 0–1 program with complete recourse. The constraints are modelled by a mixture of compact and splitting variable representations via scenarios. So, a mixed 0–1 model for each scenario cluster is considered plus the non-anticipativity constraints that equate the 0–1 and continuous so-called common variables from the same group of scenarios in each stage. Given the high dimensions of the stochastic ATFMRP instances in the real world, it is not realistic to obtain the optimal solution for the problem. Instead we propose the so-called Fix-and-Relax Coordination (FRC) algorithm to exploit the characteristics of the non-anticipativity constraints of the stochastic model.

**Keywords:** air traffic flow management rerouting problem, multistage stochastic integer programming, Branch-and-Fix Coordination, Fix-and-Relax Coordination.