
Air cargo rescheduling for demand fluctuations considering transshipments

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Abstract

Demand for air cargo transportation is very difficult to forecast due to its high volatility. This can be explained by the following factors: i) there is a reduced number of clients who transport large volumes; ii) orders are usually placed on relatively short notice; iii) cargo booked to travel often arrives partially, past its deadline, or in the last minute; and iv) there are no penalties in place for clients cancelling an order. This uncertainty can lead to significant operative inefficiencies, generating losses to the airline. In this work we propose and discuss a model for re-optimizing aircraft itineraries and order routing, considering the last-minute demand realizations. This model, which admits transshipments, takes into account the costs involved in changing the itineraries. We propose and model three different ways to evaluate this particular cost, as a function of the additional number of i) crews; ii) trips between airports; and iii) trips between airport by aircraft. Our model was tested using real-life data provided by our partner in the industry, consisting of a network of fourteen airports and a planning horizon of three days. Three different demand scenarios were constructed, with different disruption levels. Our experiments show the applicability of our methodology, which yields an increase in load factors when compared against applying the original schedule to the disrupted scenario. We also show that modeling with transshipments has a positive impact in the solution, which increases with the magnitude of demand disruptions.

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