



An airline maintenance manpower planning model with flexible strategies

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Abstract

An effective maintenance manpower supply plan not only reduces operating costs but ensures greater aviation safety and punctuality. A variety of flexible management strategies have been widely applied in other industries; however, little research has stressed flexible management strategies for airline crew scheduling problems. Here, we introduce a model that includes various flexible strategies so that an airline can effectively manage its maintenance manpower supply. The model is formulated as a mixed integer program that is solved using a commercial software package, CPLEX. In order to evaluate the model performance, we use the operating data from a leading Taiwan airline.

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1. Introduction

Effective aircraft maintenance plans cannot only reduce operating costs, but are also directly related to improving flight safety. A maintenance schedule that meets all the safety requirements will also help to ensure the punctuality of flight departures and arrivals.

In general, airline layover maintenance includes regular checks and short-term layover maintenance procedures, the planning of which is, in practice, separated, because their different features. Regular checks usually require 1 or more days to finish all the jobs and aircraft need to stay at the parking ramp while the tasks are performed. Short-term layover maintenance includes, a preflight check, a transit check, and a daily check. These are required before take-off and/or after landing. These checks are usually performed at the gate and take on average 1 or 2 h. Since they are performed before departure and/or after arrival, when the aircraft are at the gates, they have to fit within timetable and time constraints, otherwise punctuality would be affected incurring extra operating costs. Given the aircraft's maintenance requirements, airlines have to

plan their manpower resources to perform these activities. Based on observations of Taiwan airlines, maintenance manpower demands fluctuate from time to time. The difference between peak and off-peak periods can be large. It is therefore difficult for airlines to efficiently manage their maintenance crews during fluctuation in demand.

A short-term layover maintenance plan has to consider the manpower demand, the aircraft type, the maintenance crew and the available time slots. It is almost impossible to come up with a single comprehensive maintenance plan. In general, it is practical to determine a short-term layover maintenance plan by following three steps. First, the maintenance department estimates the short-term layover maintenance manpower demand in man-hours, based on the available ground holding time slots, the different aircraft types, and the tasks required. Second, a manpower supply plan is generated according to the manpower demand obtained from the previous step. The maintenance manpower supply plan is expressed in terms of the number of work shifts and the starting time for each shift to facilitate assigning the maintenance personnel. The final step is to assign maintenance personnel to meet the supply plan but still satisfy the certificate requirements, vacation schedules, and other relevant regulations.

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