

Markus P. Thiel

**Team-oriented Airline Crew Scheduling and Rostering:
Problem Description, Solution Approaches, and Decision Support**

Abstract

Airline crew scheduling is a comparably well-studied field in Operations Research, and most cost-relevant factors have been optimized to the greatest extent. As a result, usually second-class or casual attention is paid to the consideration of the teams involved that form the mandatory flight personnel. It is well-known that misunderstandings and disharmonies among the crew due to unfamiliar colleagues lead to a negative crew satisfaction which has a negative effect on the airline's customers. More importantly, their occurrence is even safety-critical with regard to the operating cockpit crew.

In this work a first interpretation of the *Team-oriented Scheduling Problem (ToSP)* is presented. Irrespective of the assignment approach chosen (bidline systems, personalized rostering or preferential bidding systems), current approaches do not account for frequently occurring changes within daily or day-by-day team compositions. So crew members rarely know in advance the strengths and weaknesses of their team-mates they are scheduled to work with. Therefore, the realization of enhanced team stability should be highly appreciated by the crew as well as by the airline itself. In this document a special emphasis is put on the personalized rostering in the so-called *Team-oriented Rostering Problem (ToRP)*.

Tailored to the requirements for the cockpit crew, namely captains and first officers, several mathematical programming-based optimization models are discussed. Based on a case study of a European tourist airline, a set of solution approaches is presented. When the new approach is embedded into a decision support system, the implied trade-off between additional operational cost and the selected evaluation criteria for team orientation, e.g., the amount of team changes, is examined along with further computational results.

Keywords: airline, cockpit crew, crew scheduling problem (CSP), crew pairing problem (CPP), crew rostering problem (CRP), crew assignment problem (CAP), decision support system (DSS), set partitioning problem (SPP), team orientation, team-oriented rostering problem (ToRP), team-oriented scheduling problem (ToSP)