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# Integrated Airline Network Planning and Flight Scheduling Model in Hub-and-Spoke Networks with Bank Structures

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The airline planning process unfolds in sequential stages, from strategic network planning, which selects routes, frequencies and fleet composition, to tactical flight scheduling, which times individual flights to maximize connectivity and passenger service. The two stages are strongly interdependent: the network plan defines the flights to be scheduled, while the quality of the resulting schedule determines the connectivity offered at the hub and, through it, the demand the airline captures. Existing approaches nevertheless optimize each stage independently, so this feedback is never exploited and the resulting decisions may be suboptimal. This paper proposes an integrated optimization framework that bridges strategic network planning and tactical flight scheduling for hub-and-spoke airline networks with bank structures. The network planning component optimizes route selection, flight frequencies and fleet composition while capturing demand–supply interactions through an empirical demand model. The flight scheduling component assigns flights to banks so as to maximize hub connectivity. A coupling mechanism lets the realized connectivity modulate itinerary attractiveness, and hence demand. Since these problems are nonlinear and nonconvex, tailored linearization techniques are designed to obtain tractable formulations, and decomposition methods are used to solve instances of realistic size. Computational experiments on realistic instances assess the benefits of joint optimization over the conventional sequential approach.