Integrating Resource Acquisition and Repositioning Decisions into Tactical Transportation Planning under Uncertainty

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We propose a scheduled service network design model that simultaneously ad dresses strategic decisions regarding fleet sizing and allocation, including acquisition and outsourcing, as well as tactical decisions regarding a repeatable
transportation plan and schedule. Moreover, as a well-sized fleet and a well-designed transportation plan should be able to accommodate fluctuations in freight volumes, the model takes the form of a stochastic program, explicitly addressing uncertainty in demand through the use of scenarios. This is the first model to consider this full suite of decisions while also recognizing uncertainty in freight volumes. Given the computational difficulties associated with solving stochastic programs exactly, we propose a column-generation-based matheuristics scheme for addressing the model, which decomposes the optimization problem across multiple dimensions, and evaluates a neighboring solution across all scenarios. This is the first heuristic scheme for this class of problem and we assess its effectiveness on two sets of instances. The first is a set generated to mimic the operations of a Less-than-truckload freight transportation carrier and the second is based on the network of a European postal carrier. We see that the solution approach is able to produce high-quality solutions for both sets of instances in run-times that are acceptable in practice.