

Improving Operations in Air Transport – Selected Papers from the 14th World Conference on Transportation Research

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The 14th World Conference on Transportation Research (WCTR) was held in Shanghai from July 10-15, 2016. The conference featured over 1,000 presentations on all transportation topics, including a dedicated track of presentations on air transport. The papers submitted to the air transport track of the WCTR were subject to a double blind review process. From the papers presented in the air transport track, eight were selected for inclusion in this Journal of Air Transport Management special issue.

The first six papers in the special issue examine how airlines, airports, passengers and the general public can benefit from better operational decisions, especially in light of constrained capacity at key hub airports. The final two papers examine how airlines use pricing and other operational strategies to respond to market incentives.

Gorripathy, Liu, Hansen and Pozdnukhov explore data mining, data reduction and clustering methods to show how airport planners can achieve better use of scarce airport capacity. The authors note that airports may be underutilized on some days (e.g., when the weather is ideal) and overcapacity during other days (e.g., when weather conditions are less than ideal). The main goal of their paper is to mine available capacity and demand data on airports in order to develop “similarity measures” between days. The data reduction techniques allow for similarities to be determined with a smaller number of variables. These key measures then allow airport managers to compare current and future days with previous, similar days, so that they can better predict required capacity. The result is that airport managers can make more informed capacity planning decisions.

Suh and Ryerson note that “extreme events”, such as thunderstorms or snowstorms, can cause significant disruptions to the air transport system. These extreme events can be especially disruptive for connecting passengers, since inbound flights to an affected hub can be severely delayed or diverted to another airport that has not experienced disruptions. Delayed or diverted passengers may take considerable time to reach their ultimate destination. With these delays in mind, the authors develop a heuristic that minimizes disruptions to passengers by choosing the “best alternative” airport for diverted flights. Applying their heuristic to a case study involving a potential disruption at San Francisco International Airport (SFO), the authors show that delays are minimized if aircraft are diverted to San Jose International Airport (SJC), rather than to other airports that have traditionally received flights diverted from SFO.

Janić examines various solutions to the problem of insufficient capacity at key airports in the air transport system. Potential solutions that have been proposed include congestion charges, the use of new technologies to better manage flight operations, and the addition of new capacity, such as the building of additional runways. The author uses case examples from the U.S., Asia and Europe to model the consequences of these three policy alternatives. He finds that each of the

alternatives has certain advantages and disadvantages. For example, congestion charging may discourage carriers from adding additional capacity at an airport, thus reducing congestion delays, but may also result in reduced competition and, presumably, higher fares. Therefore, Janić suggests careful consideration of the consequences of the policy option before it is enacted.

Xia and Zhang examine the consequences of better integration between high-speed rail (HSR) and air transport networks. Although rail travel is traditionally considered to be a competitor to air travel, it is evident that the two modes can be complementary as well. Therefore, the authors propose that there are benefits to integrating HSR and air routes at common hubs. The authors develop a series of models examining the integration of HSR and air networks and indicate the situations where this integration can be both welfare-enhancing and profitable to the air and rail carriers. The authors show that passengers always benefit from the reduction of connecting times between HSR and airline routes, but that transport operators do not have the incentives to cooperate by reducing connecting times. Finally, the authors suggest that policymakers should encourage cooperation between the modes at the most capacity-constrained hubs.

Koudis, Hu, Majumdar, North, and Stettler note that increased air traffic not only creates delays for passengers and airlines at congested airports, but also contributes to higher ambient air pollution in the areas surrounding airports. As a result, airports and airlines are under increasing pressure to reduce emitted pollutants, especially nitrous oxides (NO_x) emissions. The authors use a case study approach to focus on how reducing aircraft thrust during takeoffs at London Heathrow (LHR) might reduce NO_x emissions for a particular type of aircraft, the Airbus A319. Using data on factors that affect the level of NO_x emissions (i.e., thrust time, thrust setting, fuel flow rate), the authors simulate reduced thrust operations at LHR and examine resulting NO_x emissions. Based on their simulation results, the authors find significant benefits to reduced thrust operations.

Repko and Santos focus their research on long-term airline fleet planning. Future demand is, of course, unknown, so in determining future capacity needs, airlines must weigh the potential risks from acquiring too many aircraft with the potential for not having sufficient capacity to meet realized demand. Moreover, there are various types of aircraft that can be acquired based on capacity, range, fuel efficiency and other factors, and these acquisitions will impact an airline's cost and supply capabilities. The authors use a decision tree approach, where capacity decisions are made at various points in time as more information becomes available, to determine how decision makers should optimally determine capacity to maximize an airline's long-term profits. The application of this decision tree approach is illustrated with two case studies.

Zou, Yu, Rhoades, and Waguespack examine how airlines set fares in response to rival carriers that impose fees on checked baggage. The authors make use of the policy undertaken by Southwest Airlines (and formerly by JetBlue as well) of not imposing these baggage fees. The hypothesis advanced is that the carriers that do not assess baggage fees can raise their fares in competition with the fee-charging carriers. The authors gather data on 13,000 U.S. origin and destination routes and estimate a structural model. Their main finding is that the carriers that do not impose baggage fees can raise their fares in competition with the fee-charging carriers, but that the level of the fare increase depends on route characteristics, such as the mean level of incomes at the origin and destination cities and the extent to which the route appeals to tourists.

The results suggest that Southwest may be able to extract significant benefits in terms of increased fare revenues by not assessing baggage fees.

Wen and Yeh use a number of logit models to examine factors influencing flight preferences for passenger travel between Taiwan and Japan. In particular, the authors are concerned with factors influencing the travel dates chosen by passengers around a major holiday in Taiwan. Not surprisingly, airlines differentiate their fares based on travel dates, with higher departure fares charged as the holiday approaches. The findings from the paper indicate that passengers traveling on the low-cost carriers serving the Taiwan-Japan market will consider these higher prices when choosing their flying dates, but will also trade off potential savings from departing earlier with the number of leave days they need to use for their holiday. The findings suggest that airlines may want to target early departure dates to unemployed or retired individuals who are not concerned with taking additional time from work.

In closing, we would like to thank the authors for their paper submissions and for undergoing the somewhat arduous review process. We are also grateful to the reviewers for reading the papers and for helping the authors improve the quality of their work. Finally, we are thankful to the WCTR Shanghai Organizing Committee for their efforts in undertaking a very stimulating conference.

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