

# Siemens Competition

## Math : Science : Technology

### Regional Finalist

**Names:** Karthik Rao and Robert Karp

**High School:** Briarcliff High School

**Mentor:** Dr. David Steadman – Delta Airlines

**Project Title:** *A Network Flow Based Approach for Post-Merger Airline Hub Consolidation (Mathematics)*

In the past decade, several airline mergers have taken place, driven by a motive to increase operational efficiency. The first problem a new airline must solve is to consolidate its post-merger network. Traditionally, airlines have used statistical techniques such as logistic regression to predict the capacities of routes in the post-merger network. We propose a new decision support tool, based on the transportation network model, to predict the future capacity of routes and to provide recommendations on how to improve the efficiency of the post-merger network. The focus of this methodology is to minimize the cost for the airline considering the route network structures. This is achieved by using a network flow approach, which is solved using linear programming techniques. The Delta/Northwest merger of 2008 has validated this approach. Our results, using this approach, indicate that the total cost of the consolidated network as compared to Delta's actual 2013 post-merger network can be improved by 10 to 20 percent, which can be significant in dollar terms. Our approach was also able to predict the changes in the hub status among the major focus cities in the Delta network. These results demonstrate the potential of a network flow-based model for improving post-merger network efficiency in the airline industry.