Background

Clear Skies Consulting (CSC) Group is taking part in the Airport Cooperative Research Program (ACRP) Design Competition, a competition where university students can create strategies to address various issues with airports. The competition is broken down into four subsections: Airport Operation and Maintenance, Runway Safety, Incursion, Excursions, Airport Environmental Interactions, and Airport Management and Planning.

CSC Group has entered into the Airport Management and Planning section of the competition under the problem topic, “Strategies for accommodating aircraft that experience extended delays on the tarmac and in line for takeoff, including dealing with human needs as well as airport and airline capabilities.”

About Us

Kevin Kim will be graduating with a Bachelor of Engineering in Engineering Management.

Sydney Darby will be graduating with a Bachelor of Engineering in Engineering Management. After graduation she will be working as an Industrial Engineering Supervisor for UPS as a part of the Engineering Development Program.

Robert Williams will be graduating with a Bachelor of Engineering in Engineering Management with a concentration in Financial Engineering. After graduation he will be working as a Project Engineer for J. Fletcher Creamer & Son.

Lauren will be graduating with a Bachelor of Engineering in Engineering Management. After graduation she will be working as an Industrial Engineering Supervisor for UPS as a part of the Engineering Development Program.

John Marchese will be graduating with a Bachelor of Engineering Management. After graduation he will be working as a consultant at Longman Lindsey in NYC.
Problem Analysis

According to Allegiant Air, a tarmac delay is defined as “The extended period of time after leaving the gate or upon landing without access to a terminal or runway.” Tarmac delays are of the most frustrating grievances that travelers experience in airports. Not only are these delays a hindrance to travelers, but they can also cost airlines upwards of $3753 per hour.

The chart above represents the four main reasons that these tarmac delays occur; bad weather (accounts for 69% of delays), volume (accounts for 19% of delays), runway traffic (accounts for 6% of delays), and equipment issues (accounts for 1% of delays). While it is difficult to predict whether or not something might onset a tarmac delay, something must be done to better accommodate the aircrafts that do experience these delays to improve customer satisfaction as well as decrease unnecessary airport and airline costs.

Solution

A simulation of Newark Airport was created to represent the current reality. Then, two other simulations were created in which CSC Group tested two proposed strategies. Strategy 1 tested was how the addition of a runway would affect wait time on the tarmac. Strategy 2 tested switching the gates from airline-operated to airport-operated, meaning an arriving plane would enter the next available gate as opposed to one that is specifically owned by its respective airline. The process flow of the simulation is pictured below:

Results were recorded after 200 planes had exited the system for consistency across all simulations. In the simulation that represents the current operation at Newark Airport, planes were piling up. The average time in the system that each flight obtained was 135.3 minutes with a standard deviation of 2.27 minutes over ten runs.

Data Analysis

Solution 1 resulted in an average time in system for each flight of 87.971 minutes, which is nearly an hour less than the current reality. Solution 2 improved the efficiency of the airport more than it did the time that the planes were in the system. This means that the arriving planes were able to find a gate and deboard there passengers more often, but they did not depart from the airport any sooner because the two runways could not handle a higher capacity than it currently can. Also, planes only departed as they were scheduled to, so implementing a new schedule would likely make this solution even more effective.

Although both solutions would require vast changes to the layout of Newark Liberty International Airport, if either were to be implemented, long term financial benefits would exist. First, customer satisfaction would rise due to the reduced time waiting on a gate to become available. This would make customers more likely to return to Newark Airport as opposed to choosing competitors like JFK or LaGuardia. Also, if a minimum of one hour per day can be saved at the tarmac delay time price of $3753.00 per hour, that equates to $1,369,845.00 saved per year, per plane. Airlines would generate much more revenue which would translate to more revenue generated for Newark Airport. The costs to implement may be high, but in the long term, these solutions would provide a magnificent return.