Assignment 3: Air Transportation Systems Analysis

Date Due: September 19, 2012   Instructor: Trani

Problem 1

An airline is evaluating two aircraft to operate flights from Reagan National Airport. The following table shows two two aircraft proposed by airline executives to operate from DCA. The critical stage lengths the airline would like to fly with the selected aircraft are: a) DCA-DEN and b) DCA-PHX.

Table 1. Aircraft Considered in the Airline Evaluation.

Aircraft Considered
Boeing 757-200 with Rolls-Royce RB-211-535C engines. Aircraft maximum design taxi weight is 241,000 lb. 205 seats in a one-class layout.
Boeing 737-900ER (no winglets) powered by two *CFM56-7B26/-7B27 ENGINES AT 26,000 LB SLST*). Aircraft maximum design taxi weight is 188,200 lb. The aircraft has 205 seats in a one-class layout.

The airline would like to request your services to help them select among the two aircraft to start operations from DCA. The design airport temperature used should be the average of the high temperatures of the hottest month of the year. You can query these averages for any airport at:

http://www.weather.com/weather/wxclimatology/monthly/graph/DCA:9

More detailed information about the airport can be found at the AIRNAV database available on the web at: http://www.airnav.com/airports/ or visit the airport site.

In your analysis use the latest version of the Boeing documents for airport design (http://128.173.204.63/courses/cee5614/sites_ce_5614.html#Aircraft_Data).

a) Find the average stage length to be flown between each one of the critical OD airport pairs. In your analysis use the Great Circle Flight Path mapper link provided in our interesting web sites. Add 6% to the distances calculated to account for real Air Traffic route conditions and to account for possible weather deviations from the optimal Great Circle flight path.

b) Find the runway length needed for each one of the aircraft operating the two routes. Determine if DCA has enough runway length to support these flights.

c) Estimate the average fuel per passenger assuming a load factor of 0.85 (85% of the seats used) for both routes.

d) Considering various factors which aircraft is the best for this airline? Explain.

Problem 2

a) An airline is evaluating purchasing six Boeing 777 aircraft to operate long-range passenger services between: a) Houston (IAH) and Asian cities. The city pairs to be operated have a minimum stage length of 5,300 nm and a maximum of 7,100 nm. The airline requires a minimum of 300 seats in a three class cabin layout. Boeing is offering both the Boeing 777-200LR and the Boeing 777-300ER to the airline. The airline would like to carry 20 metric tons of freight under the fuselage to generate additional revenue. In your analysis, use the great circle mapper application and add 5% to the route distance to account for Air Traffic and weather detours.

For each of the two aircraft investigate the following:

b) Find the maximum freight capacity the aircraft could carry in both the 5,300 nm and the 7,100 nm routes if all seats are occupied? Assume ISA conditions and the Boeing recommended cruise Mach number.

c) Suggest the best aircraft for this application. Comment on factors considered.

Problem 3

An airline operates Airbus A380-800 from LAX airport to Sydney. The airline has several A380s in the fleet all powered by the Rolls-Royce Trent 900 engines. If the airline has a version of the A380 with 500 seats and maximum ramp weight of 562 000 kg, find:

a) The maximum departure weight from LAX (limited by runway length). State the runway length at LAX.

b) Find the runway length if the airline typically operates with a load factor of 0.8 and carries an extra 15 tons of belly cargo under the fuselage.

c) Can the airline fly the A380 from LAX to Singapore with the same average load as that of Sydney? Comment.