

**Air Transportation Systems Field Exam  
January 2014**

**Note:** You have 60 minutes to prepare for this examination. The preparation is closed book, but you can bring any notes that you generate during the preparation period to use in the oral exam. The oral examination will be 45 minutes long.

Make any assumptions that you believe are reasonable, but be sure to state them while answering the questions.

***GOOD LUCK!***

Global Airlines, a network legacy carrier with a large connecting hub at its base in Europe, currently offers two daily trans-Atlantic flights to a certain US airport, both operated with 300-seat B777 aircraft. This airline is considering replacing its two daily flights with a single A380 flight with a total seating capacity of 500 seats. In this question, we will consider the various factors involved in this decision, from the point of view of the airport as well as the airline.

**PART A: AIRPORT OPERATIONS**

1. What, if any, are the various factors that must be considered with regards to operations at that airport? Please comment in particular on airport infrastructure considerations, both on the airside and the landside.
2. Since most US airports are congested, one would be interested in knowing what the impact of this aircraft change on airport capacity (and therefore congestion) would be.
  - A. How would you estimate the airport capacity before/after the change? (First tell us how you would define airport capacity).
  - B. Would you expect the airport capacity to increase, decrease, or remain the same? Please justify your answer.
  - C. How might any adverse impacts on capacity be mitigated?
  - D. Suppose that instead of considering the capacity in terms of aircraft arrival/departure rates, we consider passenger arrival/departure rates. Would your answers to parts (A)-(C) above change?

## **PART B: AIRLINE PLANNING**

Global Airlines currently competes against one other non-stop competitor that also offers two daily 777 flights on this route. Both of Global's daily flights have been operating at an average load factor of 80% on this route, carrying a mix of local O-D passengers (40%) and connecting passengers (60%). The demand mix is approximately one-half business and one-half leisure passengers.

1. In qualitative terms, what are your expectations with respect to changes in each of the following measures, if Mega implements its plan to fly one A380 flight daily? That is, for each measure listed, do you expect it to increase, decrease or is the outcome uncertain? Explain fully the rationale for your answer in each case.

- (a) Total aircraft operating costs for this route (also known as "flight operating costs" or FOC)
- (b) Unit aircraft operating costs for this route
- (c) Labor productivity (ASM per employee)

2. The proposed schedule change is expected to have an impact on Global Airlines' market share of local O-D passengers in this non-stop market. Describe qualitatively your expectations of this change in market share, identifying your assumptions about the factors that might contribute to any change.

3. Taking into account expected shifts in market share, schedule preferences and seasonality, the airline's planning department estimates that the mean daily demand in each direction for the A380 flight during the upcoming summer schedule period will be 450 passengers with a k-factor of 0.20.

Describe how the principles of spill modeling can be used to estimate the average load factor on this route. Use a sketch graph of the given demand density to illustrate conceptually the required calculations as well as your expectations with respect to demand factor, proportion of fully booked flights, expected spill, and average load factor.

4. Global Airlines currently uses a leg-based revenue management (RM) system to set booking limits on different fare classes for its flights.

- (a) What will be the expected impact of this schedule and capacity decision on the average yield on this route? Explain why.
- (b) After the schedule change is implemented, if the airline were to move to a network optimization RM system, what might be the impacts on local/connecting traffic mix and yield on this flight? What factors would determine the direction of these impacts?