

Quiz 2 - Take Home

Open Notes and Internet

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Due: December 1, 2021 at midnight

Instructions

Create a solution file using the word processor of your choice. Convert to PDF and submit to Canvas. Include all screen captures of all your work including aircraft manufacturer's tables and figures, FAA nomographs and others.

Honor Code Pledge

The information provided in this exam is my own work. I have not received information from another person while doing this exam.

(your signature/name)

Problem #1 (40 points)

Problem 1

This problem analyzes the runway capacity for an airport with runway configuration shown in Figure 1. The airport fleet mix is shown in Table 1. Note that the regional airport uses the new Re-Categorization developed by FAA with 6 groups. ATC uses 2 nm as the minimum separation between arrivals and departures if mixed runway operations are in place (Note runway 5L is used for mixed operations). For this analysis we use the following technical parameters: a) in-trail delivery error of 22 seconds under IMC conditions, b) probability of violation is 5%. Arriving aircraft are “vectored” by ATC to intercept the extended centerline off the runways 5R and 5L at two fixes (points in space) located 11 miles from each runway threshold. Tables 2 and 3 show the arrival-arrival and departure-departure separations. According to Figure 1, runway 5R is the primary arrival runway and 5L is the primary departure runway.

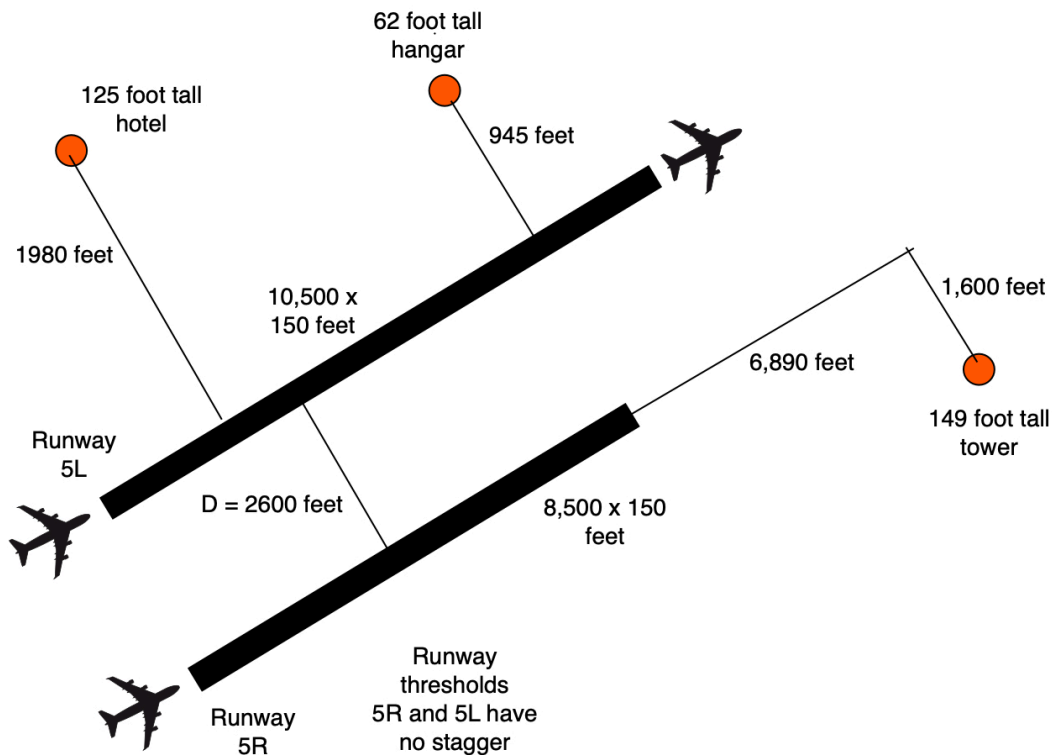


Figure 1. Runway Configuration for Problem 1.

Table 1. Runway Operational Parameters and Fleet Mix for Problem 1. RECAT Groups.

Aircraft RECAT Group	Percent Mix (%)	Runway Occupancy Time (s)	Typical Approach Speed (knots) from FAF
RECAT C	8	59	151
RECAT D	72	53	141
RECAT E	20	50	132
Totals	100		

Table 2. Minimum arrival-arrival separations under IMC conditions. Values in are nautical miles. Values Shown Do Not Include Buffers.

	Trailing Aircraft (columns)		
Lead Aircraft (below)	RECAT E	RECAT D	RECAT C
RECAT C	5	4	4
RECAT D	4	3	3
RECAT E	3	3	3

Table 3. Minimum departure-departure separations under IMC conditions. Values in are seconds. Buffers are Included.

	Trailing Aircraft (columns)		
Lead Aircraft (below)	RECAT E	RECAT D	RECAT C
RECAT C	135	130	125
RECAT D	70	70	70
RECAT E	65	65	65

- a) Estimate the arrival capacity of runway 5R in IMC conditions.
- b) Estimate the departure capacity of runway 5L in IMC conditions..
- c) Find the number of additional arrivals that can be processed on runway 5L during a two-hour period with no departures at the airport. Draw the arrival-departure diagram for answers (a-c).
- d) Briefly explain why ATC designates runway 5L as the primary departure runway.
- e) Find the maximum departure runway capacity if both runways are used during a period of no arrivals to the airport. State your assumptions about how do you operate runways 5L and 5R with departure operations.
- f) If the weather conditions are VMC, can arrivals occur on runways 5L and 5R simultaneously? Explain the runway separation rule used.

Problem 2 (30 Points)

This problem analyzes the obstructions to navigation for the airport configuration shown in Figure 1. Both runways are precision runways with ILS category 1 approach capability.

- Analyze the three objects shown in Figure 1 and determine if any of the objects is an obstruction to navigation. In your analysis, include checks to FAR Part 77, OFZ and new siting criteria (OCS). Clearly state the surface or criteria violated (if any).
- If any of the objects is an obstruction to navigation, what remedial actions can the airport authority take to mitigate the problem? Explain.

Problem 3 (30 Points)

- Specify the dimensions needed to construct a taxiway crossover to link two new parallel taxiways to be constructed at an airport (see Figure 3). Design the crossover taxiway to satisfy the TDG criteria allowing aircraft to reverse direction (see Figure 3). The design aircraft is the Boeing 777-300ER (see Figure 2). Clearly state all the dimensions needed to draw your solution (L1, L2, L3, etc.).



Figure 2. Boeing 777-300ER (A. Trani).

- Draw to scale the taxiway crossover to link the two new parallel taxiways. Clearly state all the dimensions in your solution.
- If the taxiway reversal would have been avoided, state the minimum distance between parallel taxiways.

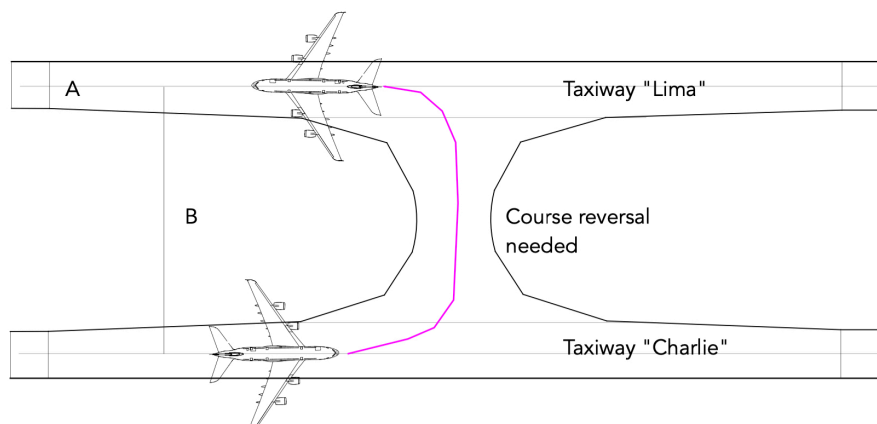


Figure 3. Schematic of Taxiway Crossover.