

SYST 461/660
MID-TERM EXAM (TAKE HOME)

SPRING 2014

Maximum Throughput Capacity (MTC) for Single, Independent Runway

Section 1 Definition of Terms

Section 2 Analysis

2 ANALYSIS

Using the Workbook and the SYST 660 spreadsheet (provided in the Syllabus) answer the following questions:

1. Why are there Compression (i.e. decreasing separation) and Separation (i.e. expanding separation) cases? Explain.

2. Which combinations of Lead-Trailing pairs on approach are Compression or Separation cases

		Trailing aircraft			
		1(H)	2(L)	3(M)	4(S)
leading aircraft	1(H)				
	2(L)				
	3(M)				
	4(S)				

3. Write down the equations for Inter-arrival Time (for both compression and separating cases)

4. Length of Approach Path

- a. Which combinations of Lead-Trailing pairs on approach include Length of Approach Path

		Trailing aircraft			
		1(H)	2(L)	3(M)	4(S)
leading aircraft	1(H)				
	2(L)				
	3(M)				
	4(S)				

b. What role does length of approach path have in determining Runway capacity. Explain (short sentence)

5. Write down the equations for the Probability of each class of Lead-Training Aircraft Pairs ($P_{i,j}$)

6. What is the Average Arrival Capacity (Ops/hr) for the following scenarios*:

Use default values for probability of fleet mix, approach speed, runway occupancy time. Set ATC Buffer to 0. Set Length of Approach Path to 6nm

Fleet Mix = 100% Heavy _____

b. Fleet Mix = 100% Large – _____

c. Fleet Mix = 100% Medium – _____

d. Fleet Mix = 100% Small – _____

7. What is the impact of fleet type?

Plot Average Arrival Capacity (Ops/hr) (y-axis) vs Aircraft Size (Heavy, Large, Med, Small) (x-axis).

Use default values for probability of fleet mix, approach speed, runway occupancy time. Set ATC Buffer to 0. Set Length of Approach Path to 6nm.

Does the Average Arrival Capacity change monotonically with decreasing aircraft? Explain why/why not?

8. What is impact of ATC Buffer?

Plot Average Arrival Capacity (Ops/hr) (y-axis) vs ATC Buffer (x-axis). ATC Buffer (Default -30%, Default -20%, Default -10%, 0, Default +10%, Default +20%, Default +30%). Use default values for probability of fleet mix, approach speed, runway occupancy time. Set Length of Approach Path to 6nm.

Does the Average Arrival Capacity change monotonically with increasing ATC Buffer? Explain why/why not?

9. What is impact of Runway Occupancy Time (ROT)?

Plot Average Arrival Capacity (Ops/hr) (y-axis) vs ATC Buffer (x-axis). Runway Occupancy Time (Default -20%, Default -10%, default +10%, Default +20%). Use default values for probability of fleet mix, approach speed. Set ATC Buffer to 0. Set Length of Approach Path to 6nm.

Does the Average Arrival Capacity change monotonically with increasing ATC Buffer? Explain why/why not?

10. Investment decision. (Use answers from 8, 9).

Two vendors are vying for a contract to improve runway capacity at your airport. You are assigned the task of determining which proposal will yield the biggest improvement in capacity. The proposals cost the same.

- (1) Vendor Boebus are proposing equipping aircraft with improved brakes that will reduce the average ROT from default values.
- (2) Vendor Airoeing are proposing equipping aircraft with Automatic Dependent Surveillance-Broadcast (ADS-B) and Cockpit Display of Traffic Information (CDTI) which will reduce the ATC Buffer from default values.

For what range of % improvement does ROT or ADS-B/CDTI yield improved runway capacity? Be specific. Explain. (Note: maybe a non-intuitive answer).

Which proposal would you select? Explain.