Assignment 8: Runway Exit Placement and Capacity

Date Due: November 8, 2023
Instructor: Trani

Problem 1

Using the cumulative runway exit distribution charts provided in class (or Figure 4-17 in the FAA AC 150/5300-13B), briefly answer the following questions:

a) Estimate the percent of AAC C aircraft that could take a high-speed runway exit located at 5800 feet at an airport located at sea level conditions.

b) if the same high-speed runway exit is built at an airport located 2,000 feet above sea level, estimate the new location of the runway exit Point of Curvature (PC).

c) Runway exit A4 (see Figure 1) is a legacy right-angle exit located 2,950 feet from runway threshold 31 at the Virginia Tech Montgomery Executive Airport (BCB). Estimate the percent of medium size corporate jets like the Cessna Citation XLS that could use runway exit A4.

d) Runway exit A3 (see Figure 1) is a new right-angle exit located 4,200 feet from runway threshold 31 at the Virginia Tech Montgomery Executive Airport. Estimate the percent of medium size corporate jets like the Cessna Citation XLS that could use runway exit A3.

e) Why do we design two entrance runway exit at the end of runway 31 at BCB? Briefly explain.

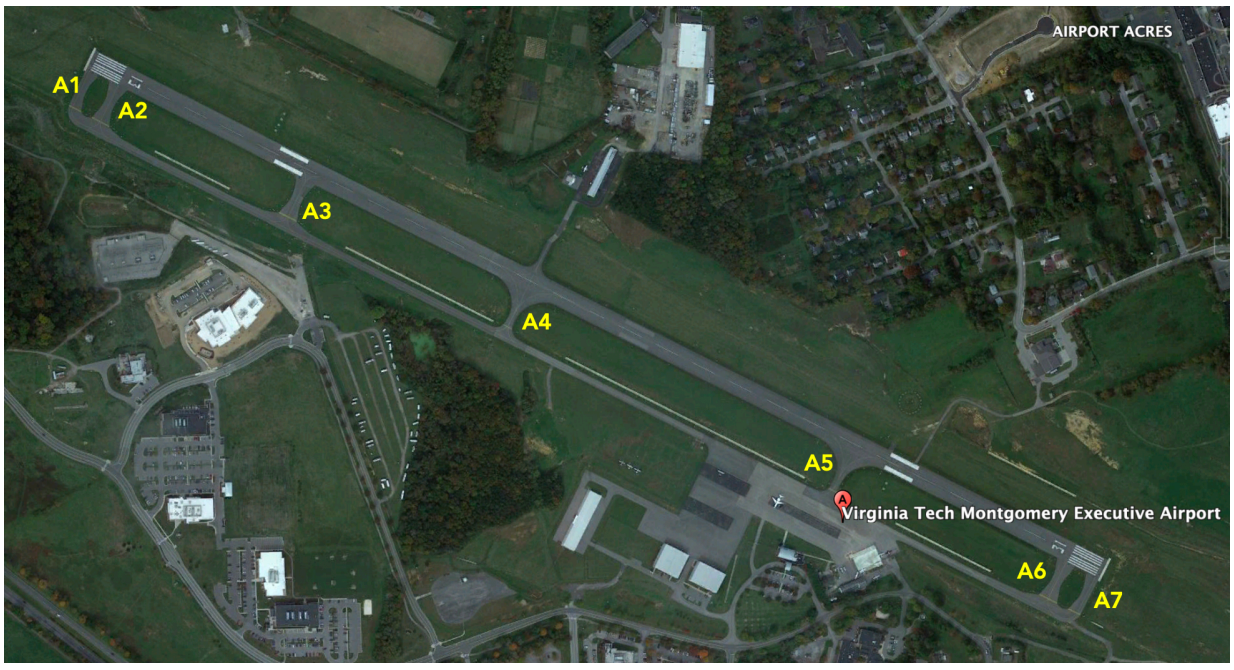

Figure 1. Blacksburg Montgomery County Executive Airport.

Problem 2

Use the latest version of the Runway Exit Design Model (REDIM) developed by Virginia Tech for FAA to evaluate the performance of runway 31 at the Virginia Tech Montgomery Executive Airport (BCB). Tables 1 and 2 show the runway exits and aircraft fleet mix at BCB.

The current version (REDIM 4) can be downloaded at the link below:

https://atsl-software-downloads.s3.amazonaws.com/redim/V4.0.0.beta6/redim.exe

The updated MATLAB Runtime should install automatically. However, you can install it separately by downloading it here:

https://atsl-software-downloads.s3.amazonaws.com/redim/MATLAB_Runtimes/MATLAB_Runtime_R2021b_Update_3_win64.exe

Use the example described in the notes to do this exercise.

Table 1. Runway Exit Characteristics of Runway 31 at BCB Airport.

Runway Exit	PC Location	Runway Exit Type
A5	1200	Right-angle
A4	2950	Right-angle
A3	4200	Right-angle
A2	5250	Right-angle
A1	5440	Right-angle

Use Arnav to find the airport elevation of BCB. Assume an operating temperature of 80 deg.F. and use 90% dry pavement conditions. Run your analysis with Pilot Motivation Factors of 1.0 (default).

Table 2. Aircraft Fleet Mix to Model Runway Occupancy Times on Runway 31 at BCB Airport.

Aircraft ID	Aircraft	Fleet Mix (%)
C172	Cessna 172	24
SR22	Cirrus SR22	10
C152	Cessna 152	30
B350	Beechcraft King Air 350	18
C25C	Cessna Citation CJ4	7
C68A	Cessna Citation Latitude	6
CL35	Bombardier Challenger 350	5
Totals		100

a) Estimate the weighted average runway occupancy time (ROT) and the standard deviation of ROT at the airport.

b) Show me the runway exit configuration diagram provided by REDIM 4.

c) Estimate the percent of Cessna CJ4 landings likely to use runway exit A3. Show the full table of runway exit assignments provided by the model.

d) Find the runway exit at BCB that is likely to be used the most . Estimate the percent of all the landings using that exit.

e) Find if the parallel taxiway A (Alpha) at BCB is compliant with RDC C-II.

Problem 3

A proposed 9,000 ft runway at at mid-west airport is expected to have a total of eight runway exits. The runway configuration is similar to the configuration of runway 18R/36L at Charlotte-Douglas International Airport (CLT). Four exits are high-speed acute angle exits (two HS exits per direction) and the remaining exits are right-angle exits. The critical aircraft is the Airbus A321neo (see Figure 3).

Figure 2. Airbus A321neo Landing at BWI Airport (A. Trani).

(a) Use the cumulative curves to locate two high speed exits allowing 55% and 95% of the critical aircraft AAC class to exit.

(b) Find the minimum separation between runway and taxiway centerlines.

(c) What is the recommended distance between the runway and parallel centerlines to allow efficient runway operations.

(d) Draw to scale the last runway entrance exit for the new runway. Include dimensions.

(e) Draw one of the high-speed runway exits (including dimensions) using the FAA templates provided at: https://www.faa.gov/airports/engineering/airport_design.