

## Assignment 5: Master Plans and Wind Rose Analysis

Date Due: October 6, 2021

Instructor: Trani

### Problem 1

Briefly answer the following questions with two or three short sentences.

- A master plan traditionally includes aviation demand forecasts. Explain the typical time horizon of master plan forecasts.
- Explain why involving the community around an airport is a good idea in developing a master plan.
- Master plans should involve financial considerations. Explain why.
- How often should we revise or update airport master plans? Briefly explain.
- Why environmental considerations are important in master plans? Give a couple of examples.

### Problem 2

Collect ten years of summarized wind information for Roanoke Municipal Airport (ROA) using the Iowa State Mesonet Database available at <https://mesonet.agron.iastate.edu/agweather/>. Note that today the airport is named Roanoke-Blacksburg Regional Airport. Perform a custom wind rose as explained in class. Import the wind data collected into an Excel spreadsheet (or program of your choice) and answer the following questions.

- Show the graphical depiction of a custom wind rose with wind speed bins in knots at 3,5,10,16,21 and 27 knots.
- How often do calm winds prevail at ROA airport?
- Find the percent of time, wind speeds range from 5-16 knots at the airport (all directions).
- Find the percent of time, wind speeds range from 10-16 knots and wind direction range from 265 to 314 degrees (with both conditions met simultaneously).
- What is the crosswind component for a Cessna 340 aircraft (see Figure 1) landing on runway 13 in Blacksburg when the automated weather observation system reports winds from 090 degrees (true) at 20 knots.



Figure 1. Cessna 340 at BCB Airport.

- f) A 3,500 meter runway is to be constructed at a new airport in Pusan, Korea. Find the design crosswind component for the airport.
- g) A Boeing 737-8Max is the largest aircraft operated at a regional airport in the US. Find the design crosswind component for the airport.
- h) Figure 2 shows a 20-year old diagram for DCA airport. Explain the change of runway labels 18-36 and 3-21 (in 2000) to 01-19 and 04-22 (today). Use the current runway heading information available in Airnav to explain.

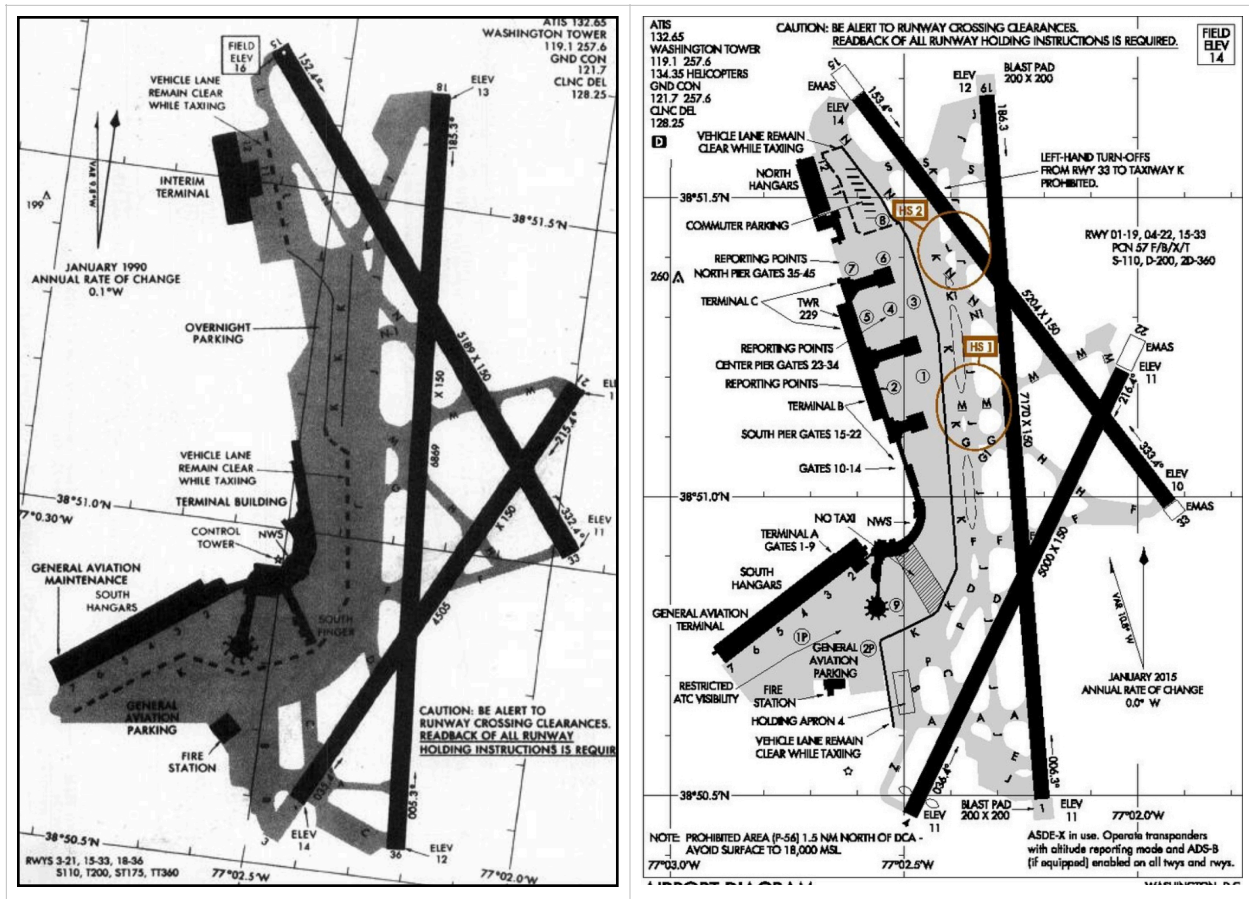


Figure 2. DCA Airport Diagrams. Left Diagram is Circa 2000. Right Diagram is Today's Airport.

## Problem 3

Use the ROA airport data collected from the Mesonet Database in Problem 2 to answer the following questions.

- a) Use Autocad and the wind rose DWG/DXF templates provided in class, to plot the traditional wind rose used in airport design. The traditional wind rose should have the percentage of wind reported values in each cell of the wind rose.
- b) Find the percent of the time runway 06 can be used for departures (or arrivals) at the airport if a 5-knot tailwind allowance is used. The critical aircraft operating at ROA is the Airbus A300-600 cargo aircraft from UPS.
- c) Find the percent of the time runway 34 can be used for departures (or arrivals) at the airport if a 5-knot tailwind allowance is used. Assume the same critical aircraft for that runway as well.
- d) Find the crosswind coverage of both runways at ROA from both directions (for every runway). Does the airport meet the 95% coverage rule? Explain.
- e) Most commercial flights use runway 06-24 at the airport. Provide a plausible reason for this.