

Assignment 6: Obstruction Analysis and Wind Rose Analysis

Date Due: October 19, 2026

Instructor: Trani

Problem #1

Use the Iowa State Mesonet model data for Roanoke-Blacksburg Airport (ROA). Specifically, collect 30 years of wind data for ROA using the Automated Surface Observing Systems (ASOS) as demonstrated in class.

- (a) Collect the data using the Iowa State Mesonet model (look at the Virginia ASOS network) and **create a custom wind rose that contains 36 direction bins** and the following wind speeds (knots). Show me the Iowa State Mesonet Wind Rose.

☒ Optional. User provided wind speed bins

0 - 3 - 5 - 10 - 16 - 21 - 28 +

- (b) Show the IEM model wind rose and find the predominant orientation of the wind.
(c) Collect the raw data used to generate the Iowa State Mesonet wind rose and bring the data using Excel.
(d) Find the percent of time, the wind is stronger than 16 knots at ROA (from any direction).
(e) Find the percent of time the airport has calm winds (< 5 knots).
(f) Find the design crosswind wind speed used in the wind rose analysis if the Airbus A300-600 is the critical aircraft (see Figure 1). State the ADG and AAC groups used in the analysis.



Figure 1. Airbus A300-600F Freighter at ROA Airport (A.A. Trani).

Problem # 2

Use the **Wind Rose Tool** demonstrated in class to do a wind rose analysis for Charlottesville, Virginia (KCHO).

- a) Specifically, collect 30 years of wind data for KCHO using the Wind Rose Tool. Use the NOAA web server to do this analysis.
- b) Verify the wind data heat map and tell me if there are any gaps in the 30-year data.
- c) Find the design crosswind component at KCHO. The largest regular use commercial aircraft using KCHO is the Boeing 717-200 (see Figure 2).
- d) Do a wind rose analysis using the Wind Rose Tool. Show me the wind rose assuming both runway ends are used and consider the critical design crosswind found in part (c). Only the design crosswind rectangle is expected in this section of the analysis. Specify the runway orientations used (in degrees).
- e) Find if the runway meets the 95% FAA wind coverage criteria using both runway ends. Use all weather and time-weighted wind calculations.
- f) Compare the wind coverage at KCHO under all-weather, VMC, and IMC conditions using both runway ends. Comment on any differences observed.
- g) Perform a wind rose analysis using multiple crosswind conditions and both runway ends in use. Compare the wind coverage between 10.5 and 13 knots.
- h) Find the percent of time, runway end 03 is favored due to wind conditions alone. Assume a 5-knot tailwind allowance.
- i) Find the percent of time, runway end 21 is favored due to wind conditions alone. Assume a 5-knot tailwind allowance.



Figure 2. Boeing 717-200 (A.A. Trani).

Problem #3

Consider the Charlottesville, Virginia (KCHO) to answer the following.

- a) Draw to scale (top view only) the following Part 77 imaginary surfaces for KCHO. Please no sketches accepted.
 1. Runway 3/21 primary surface.
 2. Approach surfaces for runways 3 and 21
 3. Transitional surface between primary and horizontal surface
 4. Horizontal surface for both runways.
- b) State the runway type (i.e., precision, non-precision, visual) used for each runway end in your drawing. Use Google Earth and Arnav to support your answer.
- c) A communications company would like to install a cell phone antenna (116 feet) at a location 6,300 feet from runway end 3 and offset 180 feet from the extended centerline. Is the antenna an obstruction to navigation? Explain the surfaces involved in your analysis.
- d) A developer would like to build an eight-story hotel (88-feet maximum height) to be located 1,230 feet perpendicular to the runway centerline. Would the hotel be an obstruction to navigation? Explain.

Problem # 4

Use the **Wind Rose Tool** demonstrated in class to do a wind rose analysis for Lewisburg, West Virginia (KLWB).

- a) Specifically, collect 30 years of wind data using the Wind Rose Tool. Use the NOAA web server to do this analysis.
- b) Find the design crosswind value at KLWB. The largest regular use aircraft at the airport is the Global Express 6000 (see Figure 3).
- c) Do a wind rose analysis using the Wind Rose Tool. Show me the wind rose assuming both runway ends are used and consider the critical design crosswind found in part (b). Tell me the coverage using both runway ends. Specify the runway orientations used (in degrees).
- d) At Lewisburg, which runway end is likely to be use the most in all-weather considering wind conditions alone? Explain.
- e) At Lewisburg, which runway end is likely to be use the most in IMC-weather conditions? Explain.
- f) Is the runway end found in part (e) consistent with the highest precision runway at LWB? Explain.



Figure 3. Global Express 6000 (A.A. Trani).