Assignment 6: Obstruction Analysis and Wind Rose Analysis

Date Due: October 20 2025

Instructor: Trani

Problem #1

Use the Iowa State Mesonet model data to construct a Wind Rose for Winchester Airport (OKV). Specifically, collect 30 years of wind data for Winchester (OKV) 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 (in knots). Show me the Iowa State Mesonet Wind Rose.

☑ Optional. User provided wind speed bins

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

(b) Collect the raw data used to generate the Iowa State Mesonet wind rose and bring the data using Excel.
(c) Find the percent of time, the wind is stronger than 20 knots at Winchester (from any direction).
(d) Find the percent of time with calm winds (< 3 knots).
(e) Find the predominant orientation of the wind.
(f) Find the design crosswind wind speed used in the wind rose analysis if the Embraer Praetor 500 (also known as Legacy 450) is the critical aircraft (see Figure 1). State the ADG and AAC groups used in the analysis.
(g) Determine if the runway's **current orientation** satisfies the FAA criteria for crosswind coverage. Remember that ASOS stations report wind according to the **magnetic north**. Tell me the actual coverage of the runway (assuming both runway ends are used). **Use the Autocad templates provided in class to construct the wind rose and calculate the coverage provided.**
(h) Find the percent of time the airport could have operations on each runway end (departures and arrivals operating against the wind) based on wind conditions. In your calculations for each runway end, assume zero tailwinds.

Figure 1. Embraer Legacy 450 (Praetor 500) (A.A. Trani).

Problem #2

Use the Elevation profile function in Google Earth to check for obstructions to navigation on the approach to runway 33 at Aspen-Pitkin County Airport (ASE).

a) As demonstrated in class, create a straight path from the runway 33 threshold (to the Southeast). Define a long path segment that spans the complete approach surface. For this analysis, ensure the path segment created is aligned with the runway centerline (see Figure 2). **Note: Distances reported by Google Earth in the elevation profiles are in statute miles.**

b) Using the runway markings in Google Earth, explain the precision of the runway ends at ASE airport. Verify with Airnav.

c) Using the Google Earth elevation profile for runway 33, identify the “peaks” over the complete approach surface for runway 33. Clearly state the dimensions of the imaginary approach surface used.

Figure 2. Sample Image in Google Earth Showing Runway 33 Threshold at Aspen-Pitkin County Airport (ASE).

d) Estimate if the “peaks” identified in part (c) constitute obstacles to navigation for runway 33 at Aspen. According to Flightaware IFR charts, Aspen has approaches with visibility minima as low as 1.5 statute miles. You only need to check the peaks identified in your elevation plot. Use the FAR Part 77 standards to do the analysis. Show your calculations and the slopes required for the imaginary surfaces for runway 33. Clearly state the size of the imaginary approach surface used.

e) Using the calculations and your analysis of parts (c-d) to explain the possible reason for a displaced threshold on runway 33.

f) If a telephone company wants to build a cell tower 1.2 nautical miles from the runway (aligned with the extended centerline of the runway), find the maximum permissible height of the tower using Part 77 standards. Show your calculations.

g) A company wants to build a 45-foot tall hangar at the airport to house two midsize corporate jets. The hangar is planned to be 600 feet laterally from the runway centerline (in middle of the field). Is this hangar permissible according to FAR Part 77 rules? Explain the Part 77 surface that applies at the location of the hangar.