Assignment 6: Obstruction Analysis and Wind Rose Analysis

Date Due: October 23, 2024

Instructor: Trani

Problem #1

Use the Elevation Profile function in Google Earth to check for obstructions to navigation on the approach to runway 25 at Eagle County Airport (EGE).

a) As demonstrated in class, create a straight path from the runway 25 threshold (to the Northwest). For a precision runway, define the path segment that spans the complete approach surface. For this analysis, ensure the path segment created is aligned with the runway centerline (see Figure 1). **Note: Distances reported by Google Earth in the elevation profiles are in statute miles.**

b) Create an elevation profile using the Google Earth tool and identify the "peaks" of the elevation profile that span the complete approach surface for a precision runway.

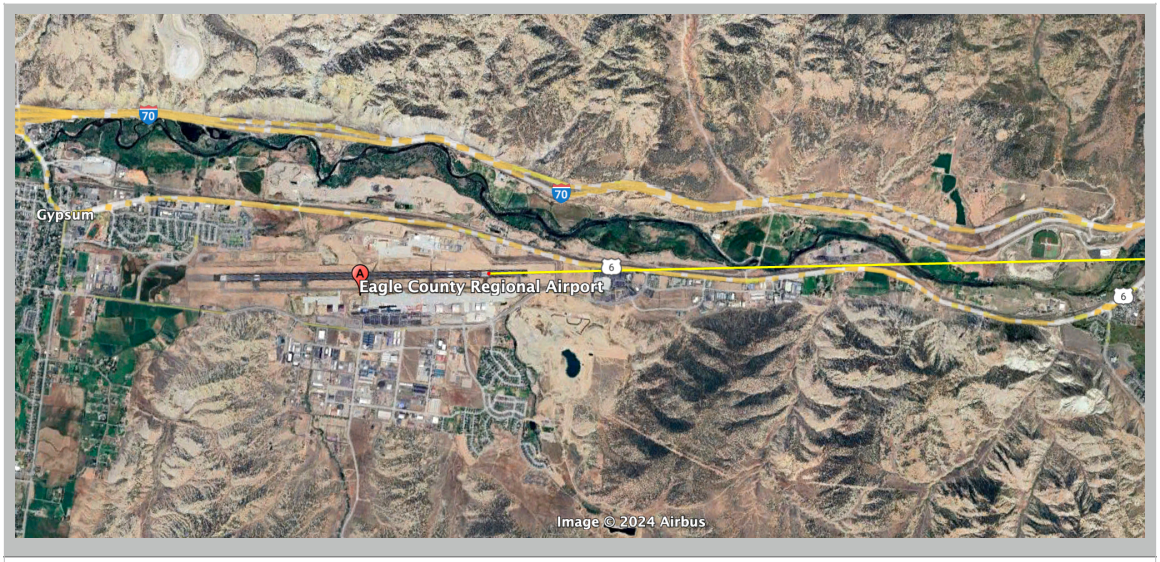

Figure 1. Sample Image in Google Earth Showing Runway 25 Threshold at Eagle County Airport (EGE).

c) Estimate if the "peaks" identified in part (b) constitute natural obstacles to navigation for a **precision runway**. You only need to check the peaks identified in your elevation plot. Use the FAR Part 77 standard to do the analysis.

d) Estimate if the "peaks" identified constitute natural obstacles to navigation for the **precision runway (runway 25)**. You only need to check the peaks identified in your elevation plot. Show your calculations and the slopes required in the approach surface.

e) Using the calculations and your analysis of parts (c-d) to explain the possible reason for a displaced threshold on runway 25.

f) Explain how you would use terrain information to check for obstacles to navigation for the complete approach surface polygon (not just the extended centerline).

Problem #2

A new 9400-foot precision runway will be constructed at a new airport (see Figure 2).

a) Use the CAD program of your choice to construct the top view of the five imaginary surfaces. Provide the dimensions of each surface.

b) Study three objects shown in Figure 2 to see if the objects violate any imaginary surface. State the FAR Part 77 imaginary surface applicable to each object. Also, state if the objects are obstacles to navigation.

c) Find if the 160-foot tall tower and the 85-foot water tank violate the Precision Approach and Departure Surfaces defined in the FAA AC 150/5300-13B (called Surfaces 6 and 7 in Tables 3-4 and 3-5, respectively in the advisory circular 5300-13B) for precision runways.

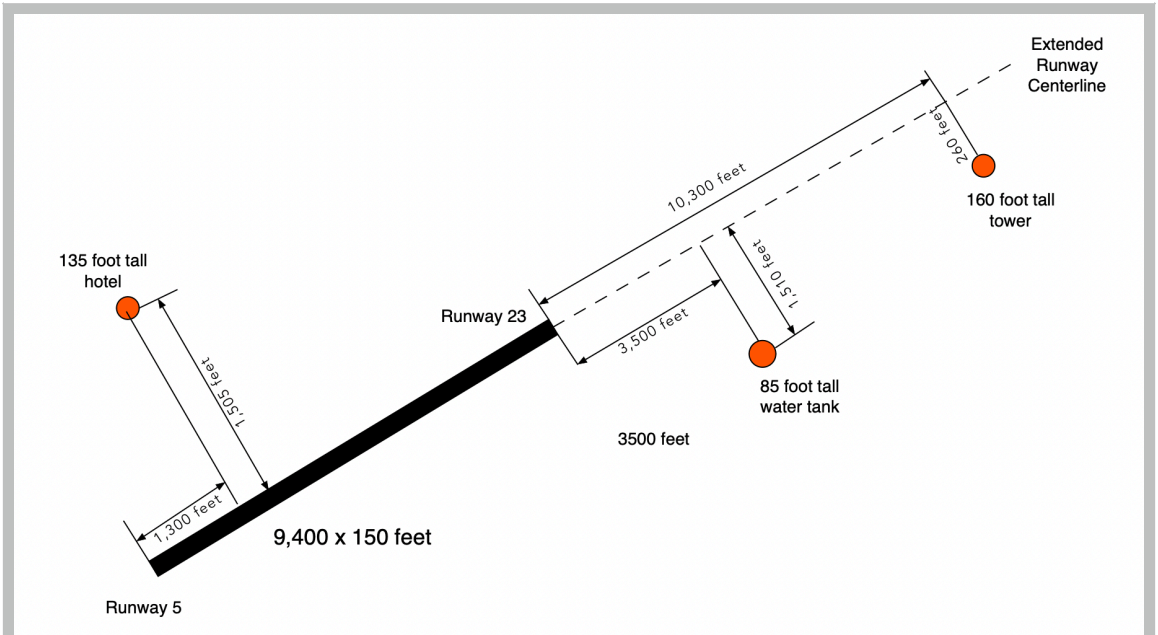

Figure 2. Objects Identified Near a Proposed New Runway. Drawing not to Scale.

Problem #3

Use the Iowa State Mesonet model data to construct a Wind Rose for Staunton/Shenandoah Airport (SHD). Specifically, wind data for the airport (SHD) will be collected using the Automated Surface Observing Systems (ASOS) for Shenandoah, as demonstrated in class.

(a) Collect the data and **create a custom wind rose that contains 36 direction bins** and the following wind speeds (knots). Find the predominant orientation of the wind.
(b) Find the percent of the time the **wind speed exceeds 18 knots** at SHD (from all azimuth directions).
(c) Find the critical crosswind wind speed used in the wind rose analysis for the Embraer 145 (see Figure 4).
(d) The critical aircraft is the Embraer 145 (Figure 4). 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.**
(e) Find the percent of time the airport could have operations on runway 5 (departures and arrivals operating against the wind) based on wind conditions. In the analysis, assume zero tailwinds.
(f) Find the percent of time the airport could have operations on runway 23 (departures and arrivals operating against the wind) based on wind conditions. In the analysis, assume zero tailwinds.

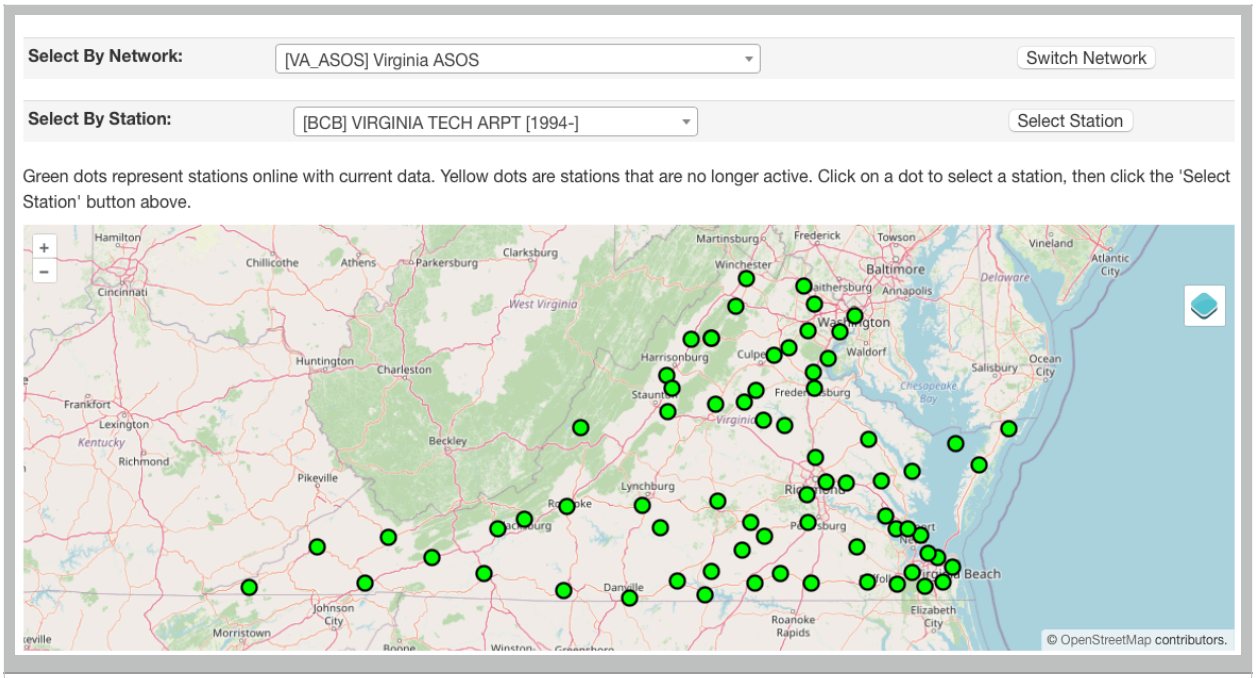

Figure 3.Iowa State Wind Data Site for Virginia ASOS Sites.

Figure 4. Embraer 145 (A.A. Trani).