Assignment 6: Obstruction Analysis and Geometric Design Standards

Date Due: October 20, 2023

Instructor: Trani

Problem #1

Use the Elevation Profile function in Google Earth to check for obstructions to navigation to the NW of the BlacksburgMontgomery County Executive Airport (BCB). Here is the analysis to be done.

a) Create a straight path from runway 13 threshold (to the Northwest) as demonstrated in class. Make sure the path segment is 8 miles long and aligned with the runway centerline (see Figure 1).

b) Create an elevation profile using the Google Earth tool and identify the "peaks" of the elevation profile within 8 statute miles.

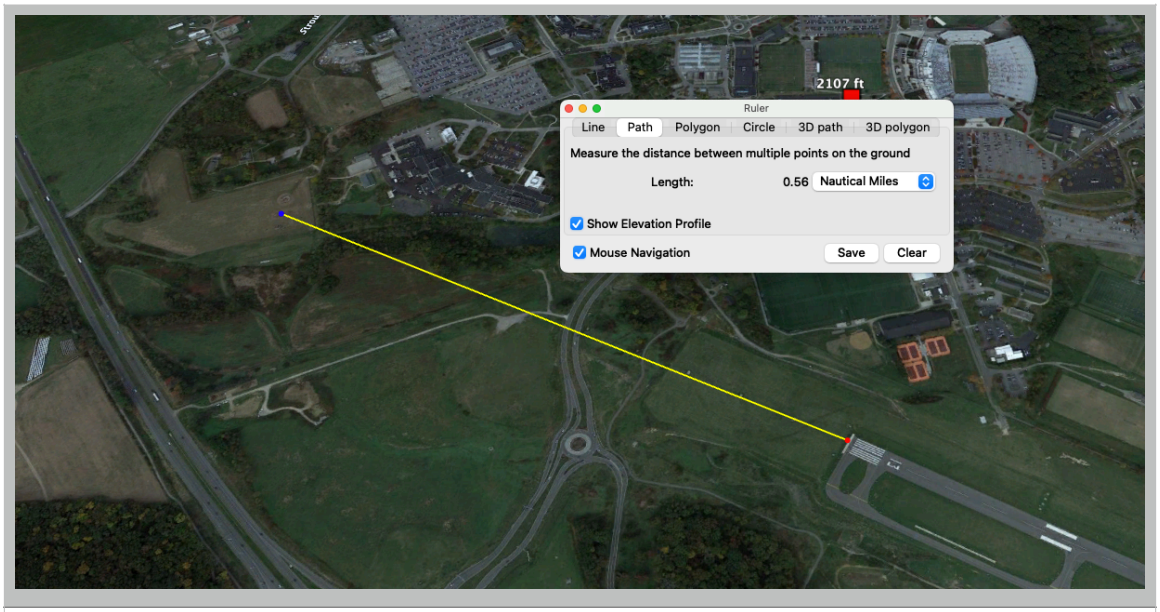

Figure 1. Sample Image in Google Earth Showing Runway 13 Threshold at Blacksburg Montgomery County Executive Airport.

c) Estimate if the "peaks" identified 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 a **non-precision runway**. You only need to check the peaks identified in your elevation plot. **Use the FAR Part 77 standard surfaces to do the analysis.**

e) Given the analysis in parts (c) and (d), tell me what type of runway is runway 16 (i.e, approaching from the NW).

f) Verify your answer in part (e) with the runway markings.

g) Could runway 13 be improved to be a precision runway? Briefly explain the reasons of your answer.

Problem #2

Use the Elevation Profile function in Google Earth to check obstructions to navigation to the West of the Eagle County Regional Airport (EGE). Here is the analysis to be done.

a) Create a straight path from runway 07 threshold on the extended centerline. Make sure the path segment is 8 miles long.

b) Create an elevation profile using the Google Earth tool and identify the "peaks" of the elevation profile within 8 statute miles.

c) Estimate if the "peaks" identified constitute natural obstacles to navigation for a **precision and a non-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) What kind of approach meets the Part 77 criteria for approaches to runway 07? Explain.

e) Verify your answer in part (d) with the runway markings.

Problem #3

Use Google Earth and Airnav to answer the following questions for the Shenandoah Regional Airport.

1) Check with the airnav database the type of runway for thresholds 05 and 23.

2) Draw to scale a top view the five imaginary surfaces for runway 05/23 paying attention to the answers your found in part (a). Clearly identify the dimensions of the surfaces in your drawing.

3) Check the critical obstacle declared for runway 05 (in airnav) and verify if the critical obstacle violates the approach surface for runway 05.

4) If the critical obstacle is a violation state what actions could the airport and the FAA take to make the runway complaint.

Problem #4

Figure 2 shows three objects identified as critical in the siting of a new airport. The new airport will have a 7,000-foot long **precision** runway. The precision runway is expected to operate with visibility minima as low as 1/2 mile. Note that the Airport Reference Point (ARP) is located 5,000 feet down the runway. The ARP is the datum point for the distances to each object to be evaluated.

a) Find if each object constitutes an obstacle to navigation. State the Part 77 imaginary surface applicable to each object.

b) Find if the 158-foot tall building structure violates the Precision Approach and Departure Surfaces defined in the FAA AC 150/5300-13B (called Surfaces 5, 6 and 7 in the advisory circular) for precision runways (see Figures 3-7, 3-8, and 3-9 in FAA AC 150/5300-13B) .

c) If any of the objects is an obstruction to navigation, propose a mitigation strategy.

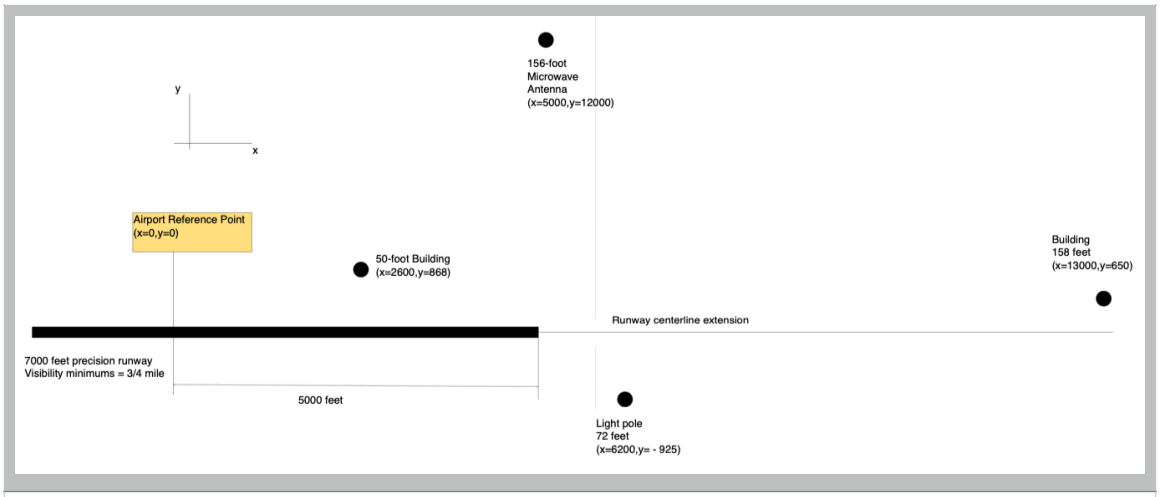

Figure 2. Objects Identified Near a Proposed New Airport.

Problem #5

Use the Iowa State Mesonet model data to construct a wind rose for Blacksburg Montgomery Executive Airport (BC). Specifically, collect wind data for the airport (BCB) using the Automated Surface Observing Systems (ASOS) for Blacksburg as shown in Figure 3.

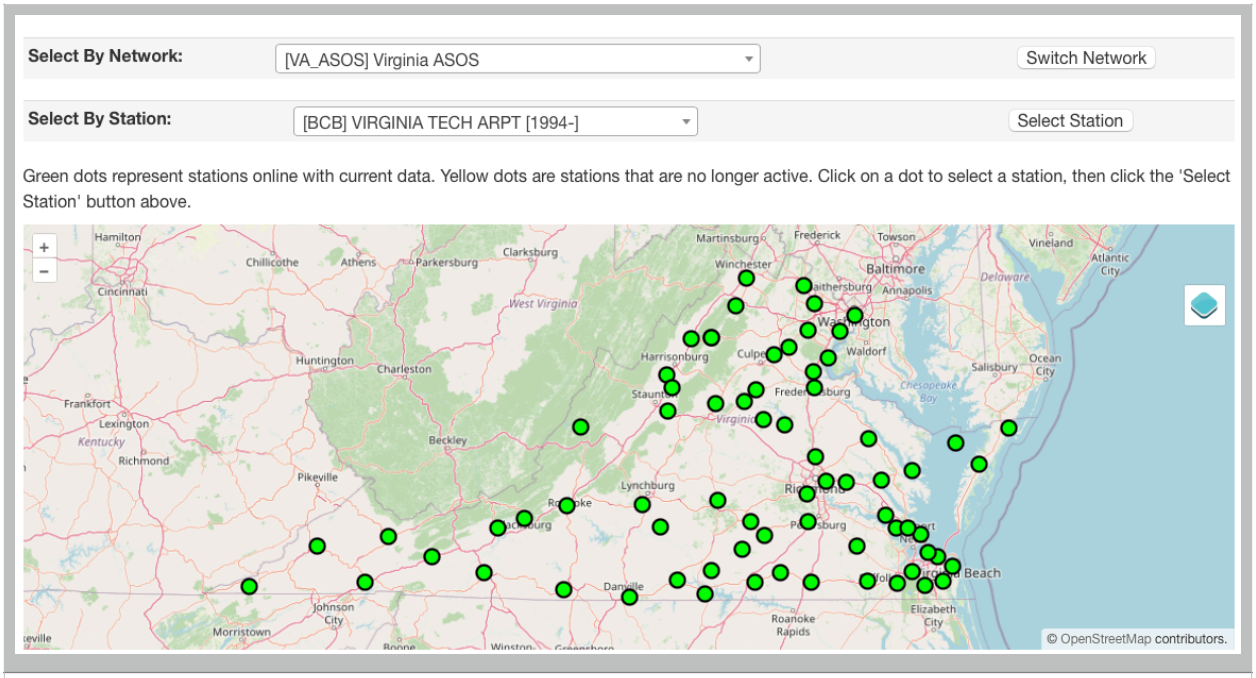

Figure 3.Iowa State Wind Data Site for Virginia ASOS Sites.

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.

	Hourly Observations of Wind Speed (knots)									
Direction	**0-3**	**4-6**	**7-10**	**11-16**	**17-21**	**22-27**	**28-33**	**34-40**	**> 41**	**Total**

b) The critical aircraft is the Bombardier Challenger 350 (CL350 see Figure 4). Determine if the **current orientation** of the runway satisfies the FAA criteria for crosswinds. Remember that ASOS stations report wind according to the **magnetic north**.

c) Find the percent of time, the **wind speed exceeds 21 knots** at BCB (from all azimuth directions).

Figure 4. Bomabardier Challenger 350 (A.A. Trani).

d) Find the critical crosswind wind speed used in the analysis for the Challenger 350.

e) Find the percent of time the airport could operate runway 31 solely based on wind conditions. In the analysis, assume zero tailwind.

f) Find the percent of time the airport could operate runway 13 solely based on wind conditions. In the analysis, assume zero tailwind.