

## Assignment 5: Master Plans and Wind Rose Analysis

Date Due: October 5, 2022

Instructor: Trani

### Problem 1

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

- The master plan for LAX explained in class included two alternatives each one with one additional runway. Explain why such alternatives were discarded.
- The master plan process must involve the community. Explain why as an engineer you need to involve the community. How would you involve the community. Provide one concrete example.
- Flora and fauna are considerations in the master plan. Explain the rationale for including such factors.
- Explain the reasons for the low flight demand at the Felipe Angeles Mexico airport.
- Why environmental considerations are important in master plans? Give an example.

### Problem 2

Collect summarized wind information for Virginia Tech Airport (BCB) using the Iowa State Mesonet Database available at <https://mesonet.agron.iastate.edu/agweather/>. Perform a custom wind rose as explained in class. Use data from 1994 until the most recent datasets. 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 BCB airport?
- What is the most prevalent wind direction observed at BCB during the period of analysis?
- Find the percent of time, wind speeds range from 10-21 knots at the airport (all directions).
- Find the percent of time the wind blows from directions from 240 to 320 degrees.
- What is the design crosswind component for a Bombardier Challenger 350 aircraft (see Figure 1).



Figure 1. Bombardier Challenger 350 at BCB Airport.

## Problem 3

Answer the following questions.

- A 1,900 meter runway is to be constructed at a new airport in Pakistan. Find the design crosswind component for the airport.
- A new airport in Oregon is designed to serve the following aircraft: Boeing 787-9, Boeing 737-8Max, Airbus A320, Embraer 190, and large corporate jets represented by the Gulfstream 550. Find the design crosswind component for the airport.
- One day an Airbus A319 lands on runway 06 at Roanoke-Blacksburg Regional Airport. The pilot listens to the Automated Surface Observing System (ASOS) which reports the wind from 100 degrees and 24 knots. Find the crosswind and headwind/tailwind component for the flight.
- Find the design crosswind component for a Pilatus PC-12 NG (see Figure 2). State the ADG and AAC groups for the aircraft.



Figure 2. Pilatus PC-12 NG.

## Problem 4

Use the BCB airport data collected for Problem 2 to answer the following questions. The Bombardier Challenger 350 is the design aircraft at BCB (see Figure 1).

- 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.
- Find the percent of the time runway 31 can be used for departures (or arrivals) at the airport if a zero tailwind allowance is used. Pilots of small planes do not like to takeoff with a tailwind conditions.
- Find the percent of the time runway 13 can be used for departures (or arrivals) at the airport if a zero tailwind allowance is used.
- Find the crosswind coverage at BCB. Does the airport meets the 95% coverage rule? Explain.
- The airport used to have two runways three decades ago. The second runway was oriented 06/24. Explain why the airport could make a change from two runways to one?