Assignment 5

Date Due: March 1, 2016 Instructor: Trani

Problem 1

Sydney (Australia) is trying to build a new airport. You can find information about the proposed airport at: http://westernsydneyairport.gov.au/western_sydney/index.aspx. A document containing the airport plan is found at: http://westernsydneyairport.gov.au/files/western_sydney_airport_draft_plan.pdf. Familiarize yourself with the long-term concept layout of the proposed airport on page 21 of the document.

a) Based on your knowledge of runway separation standards for the U.S. and ICAO, can the future Western Sydney conduct simultaneous approaches to two parallel runways? Explain the rule used.

Yes. ICAO requires 1365 meters (4480 feet). FAA requires 4300 feet.

b) Are the runway safety areas and other protection surfaces well laid out?

c) What is the ultimate passenger capacity of the Western Sydney Airport? 82 MAP

d) For Chicago O'Hare International Airport, explain the runway labeling scheme used for the five parallel runways when conducting Westflow operations (i.e., flying approaches from Lake Michigan to the West). Which rule is used?

Problem 2

A new airport location has been proposed and the airport design team would like to know the optimal runway orientation at the site. The airport is expected to receive commercial regional jet traffic with the Embraer 175 regional jet as the critical aircraft (see figure below). For this analysis use the FAA Java application for wind rose available at: https://airports-gis.faa.gov/airportsgis/publicToolbox/windroseForm.jsp. Wind data collected at the airport proposed site is shown in Table 1.

Figure 1. Embraer 175 on Short Final to ORD Runway 27L (A. A. Trani).

a) For the proposed airport, find the **design crosswind component** according to FAA criteria.

16 knots according to the FAA. ADG C-III.

b) Find the optimal runway orientation for the runway (or runways) for the airport using the wind data provided in Table 1. Plot the runway orientation vs. the coverage achieved for every runway orientation every 10 degrees and indicate the optimal runway

orientation in your plot. Show the final wind rose for the optimal solution indicating the coverage obtained using both runway thresholds.

Use 60 knots as the tailwind component in the analysis to find the optional single runway orientation for the runway operated in both directions.

Optimal orientation is 180/360 degrees. Coverage using both directions is ~98.3%.

c) Find the percent of the time **each runway end** can be used (independently) if a 5-knot tailwind is allowed in the calculations. What runway end will likely be used the most? Explain.

Runway 36 (heading 380 degrees) can be used 84% of the time and runway 18 (180 degrees) 89% of the time with a 5 knot tailwind allowance.

d) What would be crosswind design criteria if the airport was designed in Spain? Explain.

The airport elevation is not know. However, the runway length requirements for the E175 vary from 1450 to 1800 meters depending on the assumptions of temperature and elevation. ICAO recommended practice is:

- 24 km/h (13 kt) in the case of aeroplanes whose reference field length is 1 200 m or up to but not including 1 500 m.
- 37 km/h (20 kt) in the case of aeroplanes whose reference field length is 1 500 m or over, except that when poor runway braking action owing to an insufficient longitudinal coefficient of friction is experienced with some frequency, a cross-wind component not exceeding 24 km/h (13 kt)

Problem 3

The following wind observations (Figure 2) were collected several years ago at a rural location being considered as a potential airport site. The data collected shows the percent of time the wind blows from a specific direction and for a speed range (in knots as shown in Figure 2). The inner circle shown as a shaded area represents winds less or equal than 10 knots.

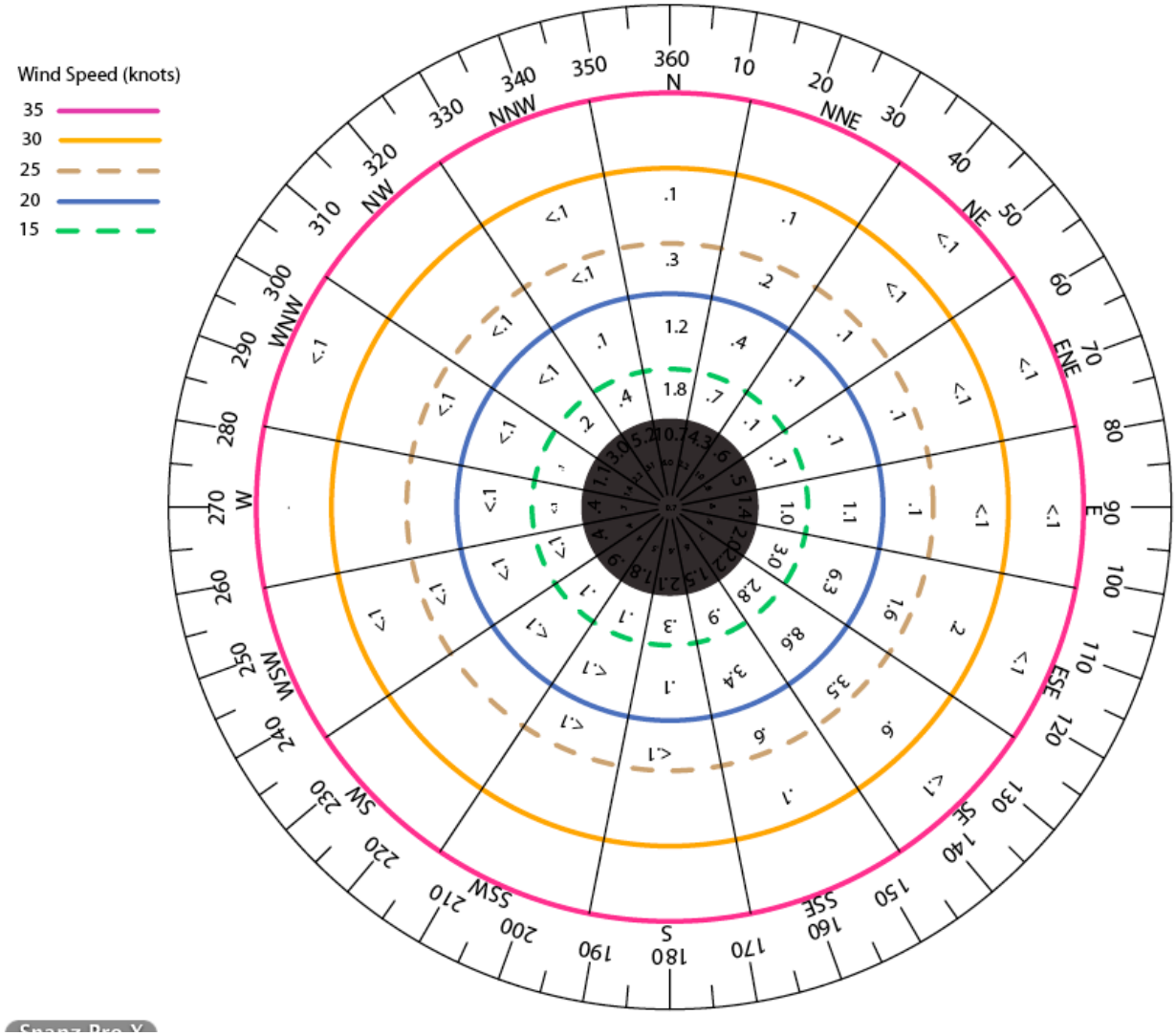

Figure 2. Legacy Wind Rose Data for a Proposed Airport Site.

a) Using the information provided, estimate the best runway orientation for this location. The aircraft population expected to operate at the airport facility are: 1) 40% regional jets like the Bombardier CRJ-900, and 2) 60% narrow-body transport aircraft like the Boeing 737-800.

Critical Aircraft is Boeing 737-800 and belongs to RDC (ADG) D-III. use 16 knots of crossing component. Optimal orientation is 125/305 degrees.

Problem 4

Familiarize yourself with the Roanoke-Blacksburg Regional Airport (ROA) using Google Earth and answer the following questions.

a) Check compliance of the **runway safety area beyond the runway for landing** aircraft on runway 34. Runway 34 has an ILS approach with visibility minima of 1 mile (check http://uk.flightaware.com/resources/airport/ROA/IAP/ILS+OR+LOC+RWY+34/pdf). The largest aircraft operating at ROA are cargo Boeing 757-200 and Airbus A300-600.

Runway 34 has an EMAS whose length is around 300 feet. A Boeing 757 needs an EMAS of 450 feet. The ROA EMAS was probably designed for a regional jet (like the CRJ 200).

b) How has this airport cope with the RSA compliance for operations on runway 34? Briefly explain.

Partial compliance.

c) Check runway threshold 24. Explain the rationale for the displaced threshold on runway 24. Contrast the threshold 24 with threshold for runway 6. Offer some insight.

Runway 24 needs 600 feet protection from undershorts. The runway displaced threshold is necessary because terrain prior to runway 24 is steep.