

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.

- 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.
- Are the runway safety areas and other protection surfaces well laid out?
- What is the ultimate passenger capacity of the Western Sydney Airport?
- 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).

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

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

Table 1. Wind Data for New Airport. Speeds are Shown in knots (i.e., nautical miles per hour) in the Table Header.

Azimuth (degrees)	0-3	4-6	7-10	11-16	17-21	22-27	28-33	33-40	41 and over
10	569	453	198	234	36	30	12	5	3
20	539	398	329	250	129	36	20	10	2
30	320	230	84	10	0	0	0	0	0
40	287	230	145	45	13	0	0	0	0
50	415	210	129	86	33	12	0	0	0
60	457	508	142	76	25	12	8	0	0
70	524	277	143	30	0	0	0	0	0
80	390	185	182	42	0	0	0	0	0
90	148	186	191	114	6	0	0	0	0
100	460	400	129	13	0	0	0	0	0
110	320	220	169	91	34	14	0	0	0
120	560	540	400	178	40	20	5	0	0
130	534	400	230	78	11	0	0	0	0
140	632	520	240	59	17	17	17	17	17
150	418	230	120	55	44	16	14	4	2
160	635	760	540	210	120	80	33	20	13
170	634	490	320	190	45	43	14	18	2
180	569	453	198	234	36	30	12	5	3
190	460	400	129	13	0	0	0	0	0
200	515	243	213	26	13	13	13	13	7
210	432	319	213	78	24	1	0	0	0
220	667	347	236	93	62	47	41	12	3
230	286	210	123	74	31	1	0	0	0
240	85	202	198	106	35	0	0	0	0
250	190	238	178	98	21	12	0	5	0
260	461	512	146	80	29	16	12	4	4
270	236	221	141	94	29	0	0	0	0
280	436	231	150	107	54	33	21	21	6
290	198	227	185	77	8	0	0	0	0
300	548	301	167	54	24	16	12	5	3
310	258	127	107	50	8	0	0	0	0
320	98	215	211	119	48	13	8	0	0
330	269	153	119	46	30	13	5	4	2
340	289	195	99	22	0	0	0	0	0
350	238	128	128	38	0	0	0	0	0
360	267	201	105	28	9	3	1	0	0

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.

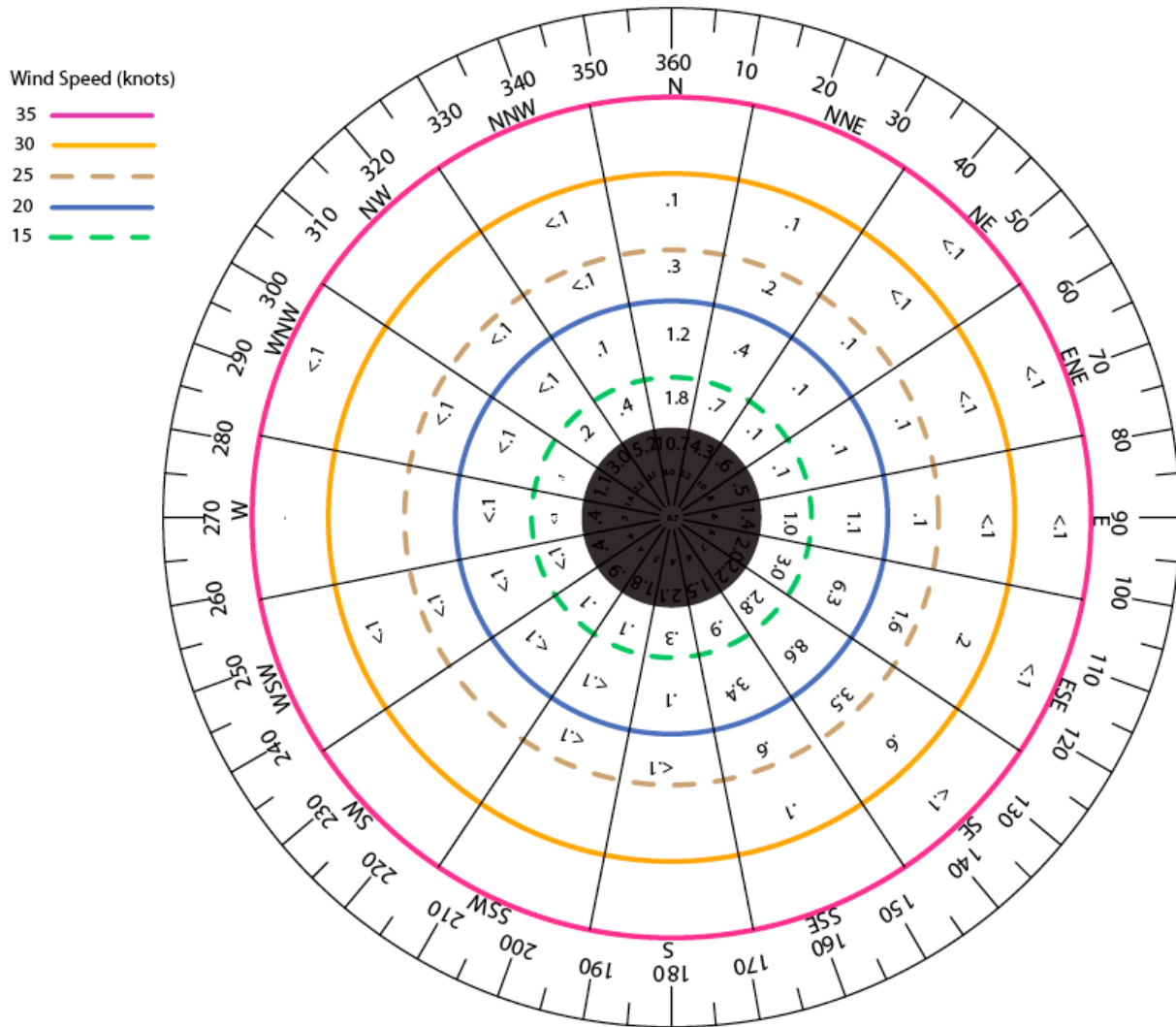


Figure 2. Legacy Wind Rose Data for a Proposed Airport Site.

- 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.

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