Assignment 5: Obstruction Standards and Wind Rose Analysis

Date Due: March 3, 2014

Problem 1

A new airport is expected to serve airline operations using an Embraer 195 aircraft. The runway length needed has been estimated to be 2,500 meters. The airport is located at an elevation of 2,100 feet above mean sea level conditions. The airport will have an instrument landing system and serve approaches with visibility minima down to 1/2 miles (ILS Category I equivalent approach). Determine the following dimensions for your design:

a) The length and width of the approach and departure surfaces for the airport

b) The elevation of the horizontal surface above mean sea level conditions

c) The width and length of runway blast pad area.

d) The width of the runway and taxiway shoulders.

e) Distance from the runway to a parallel **taxiway** if high-speed runway exits are to be constructed.

d) Distance from the runway to a parallel **taxiway** if only right-angle runway exits are to be provided.

e) Width of taxiway safety area.

f) Minimum distance from the taxiway centerline to a fixed object.

g) Minimum perpendicular distance from the runway centerline to a hangar with height 30 meters.

Problem 2

a) The airport authority wants to know if the objects near an airport constitute obstacles to navigation. The proposed location of the these objects is shown in Figure 1. Determine if each object is an obstruction to navigation. State which surface is critical (i.e., in violation). The runway shown in Figure 1 is a 2,700 meter precision runway.

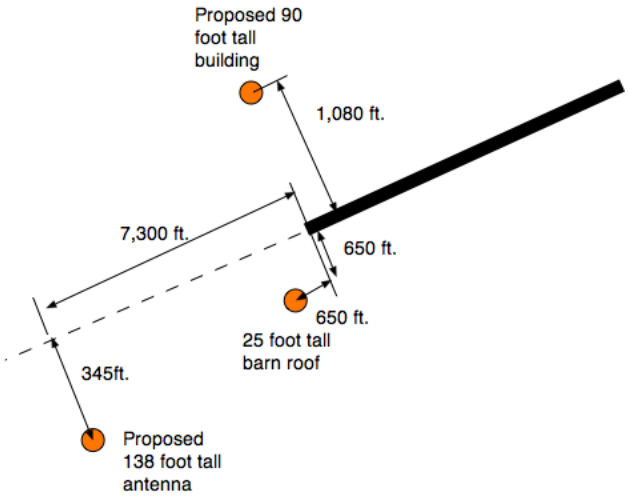

Figure 1. Proposed Location of Objects to be Checked in Problem 2.

b) Find the location of a point that intersects the horizontal, approach and transitional surfaces. State the location of the point with respect to the centerline runway end point.

Problem 3

a) An airline operates Boeing 747-8 aircraft to an airport with a single precision runway as shown in Figure 2. The airline is proposing building a 80-foot tall hangar to be located 500 feet perpendicular from the runway centerline as shown in Figure 2. Perform the necessary analysis to determine if the proposed hangar violates the runway Obstacle Free Zone (OFZ) (see Figure 2). The runway is a precision runway with a Category 1 Instrument Landing System (ILS). State the dimensions of the OFZ for this runway.

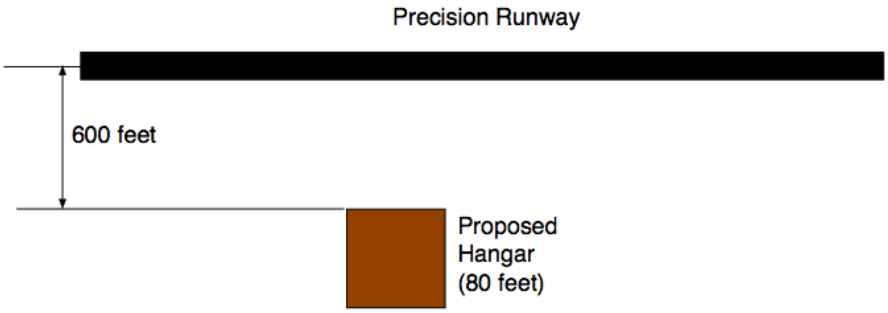

Figure 2. Proposed Hangar Location.

b) Draw to scale the cross section of the inner transitional OFZ surface for this problem and show the dimension of the proposed hangar. Refer to Figure 3-4 of FAA Advisory Circular AC 150/5300-13 for details or consult the course notes.

c) Does the hangar violates any of the 5 imaginary surface at the airport?

Problem 4

A new airport in Oregon has been proposed. The airport is expected to receive commercial traffic with the Embraer 195 as the largest aircraft operating at the airport. For this analysis use the FAA computer program AD42.exe demonstrated in class or the FAA Java application for wind rose available at: https://airports-gis.faa.gov/airportsgis/publicToolbox/windroseForm.jsp. Wind data was collected and is shown in Table 1.

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

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 resulting 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 if zero tailwind is allowed in the calculations.

Table 1. Wind Data for New Airport. Speeds are Shown in Knots 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	365	429	285	94	2	1	0	0	0
20	300	537	200	95	34	14	0	0	0
30	540	208	190	27	0	0	0	0	0
40	613	309	121	26	11	0	0	0	0
50	525	300	200	13	0	0	0	0	0
60	238	177	134	13	3	0	0	0	0
70	122	306	195	52	21	6	0	4	0
80	400	290	206	180	153	40	20	0	0
90	145	223	94	11	0	0	0	0	0
100	236	320	86	13	0	0	0	0	0
110	359	319	84	10	0	0	0	0	0
120	284	317	154	45	13	0	0	0	0
130	415	210	129	86	33	12	0	0	0
140	457	508	142	76	25	12	8	0	0
150	524	277	143	30	0	0	0	0	0
160	650	400	182	42	0	0	0	0	0
170	560	389	230	214	65	0	0	0	0
180	560	299	151	345	90	40	19	0	0
190	267	426	204	108	21	0	0	0	0
200	236	325	222	102	10	0	0	0	0
210	177	332	210	67	15	1	0	0	0
220	202	236	233	104	34	0	1	0	0
230	146	207	181	114	31	1	0	0	0
240	235	202	198	106	35	0	0	0	0
250	310	185	198	81	65	42	20	0	0
260	26	132	181	93	8	0	0	0	0
270	236	221	141	94	29	0	0	0	0

Azimuth (degrees)	0-3	4-6	7-10	11-16	17-21	22-27	28-33	33-40	41 and over
280	148	285	154	101	20	0	0	0	0
290	198	227	185	77	8	0	0	0	0
300	179	227	167	87	10	0	0	0	0
310	26	117	107	50	8	0	0	0	0
320	179	196	84	36	3	1	0	0	0
330	118	146	131	33	0	0	0	0	0
340	210	195	99	22	0	0	0	0	0
350	29	269	128	38	0	0	0	0	0
360	312	209	211	107	36	42	0	0	0