Assignment 6: Geometric Design Standards

Date Due: March 24, 2014

Problem #1

A new airport is expected to serve Airbus A320 type as the critical aircraft. The runway length is expected to be 2,300 meters. The airport is located at an elevation of 3,200 feet above 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 width and length of runway blast pad area.

b) The width of the runway and taxiway shoulders.

c) 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) Distance from runway centerline to holding line on a right-angle runway exit.

f) Width of taxiway safety area.

g) Minimum distance from a taxilane centerline to a fixed object.

h) Minimum perpendicular distance from the runway centerline to a 30 meter tall building.

i) The width of a dual taxilane between two terminal buildings. Assume one service road per side and also assume aircraft park "nose in" in front of each building.

Problem #2

A 2,760 meter long runway at an airport has three longitudinal grades (from left to right): at 0.3%, -0.90% and 0.65% with the points of intersection located at metric stations 740 and 1680 from the left threshold. Assume the left threshold is station 0+0 metric.

a) Test the suitability of this runway to be used at a commercial airport with Airbus A320 operations. Comment on your answers.

b) Design the first transition curve for this runway using a symmetric parabola. Specify the elevations (every 10 meters) as a function of the station (in meters). Refer to the formulas in the handout Geometric Design to create a symmetrical parabola. Use Excel or Matlab to simplify your work. You are allowed to use the Matlab script provided in class.

Problem #3

Consider the Roanoke-Blacksburg Regional Airport in Virginia . Use Google Earth and Airnav Systems to construct a simple drawing or sketch of the airport two runways. The largest aircraft operating at Roanoke is a Boeing 767-200 cargo aircraft.

a) Construct a visibility polygon for the airport two runways. State the dimensions of the polygon in the drawing and the rule used to construct the polygon.
b) Use Google Earth to locate any buildings, hangars or other fixed objects that could compromise the visibility at the airport.

Problem #4

Compare the geometric design characteristics of a 90-degree taxiway-taxiway junction for an airport in the US to serve Airbus A380-800. Draw to scale (using the CAD program of your choice) the FAA solution. Compare your solution to the solution stated in the Airbus Document Aircraft Characteristics for Airport Planning. Comment on any discrepancies observed.

Problem #5

Estimate the best runway exit location for regional aircraft such as the Bombardier CRJ-1000 Nextgen. The parameters of the aircraft are shown in Table 1.

Table 1. Aircraft Parameters for Problem 5. Refer to Matlab Code in Notes 9 Handout for Explanations. All other Parameters are Assumed to Take the Values Defined in the Handout.

Aircraft Group	Parameters	Representative Aircraft
Regional aircraft	Touchdown location = 430 meters Average deceleration = -1.9 m/s-s Free roll time = 2.0 seconds	Bombardier CRJ-1000 Nextgen

a) In your solution assume the approach speeds vary from 125 to 135 knots (uniformly distributed).

b) Repeat the procedure to find the best location of a high-speed runway exit for the same aircraft.