Assignment 6: Obstruction Standards and Declared Distances

Solutions

Problem 1

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 has a length of 8,200 feet precision runway. The locations of the objects are shown as (x,y) distances (in feet) from the runway threshold as shown.

Antenna is an obstruction to navigation. Is higher than 200 feet above airport reference point elevation within 3 miles of the airport.

The hill top is inside the horizontal surface. No violation.

The warehouse is a violation because it pierces the approach surface by 28 feet.

b) Find if any of the objects violates the new FAA runway site requirements.

Check both arrival and departure surfaces. The dimensions are given in Table 3-2. I used the precision runway results.

Problem 2

The airport shown in the figure has a single runway with some potential obstacles as shown in the graphic. The runway is a precision runway with approaches with visibility minimums down to 1/2 mile. The first 200 feet on the west side are flat and then slope uniformly to 20 feet above the runway level. A railroad track is located in the flat section of the ground 560 feet from the runway end.

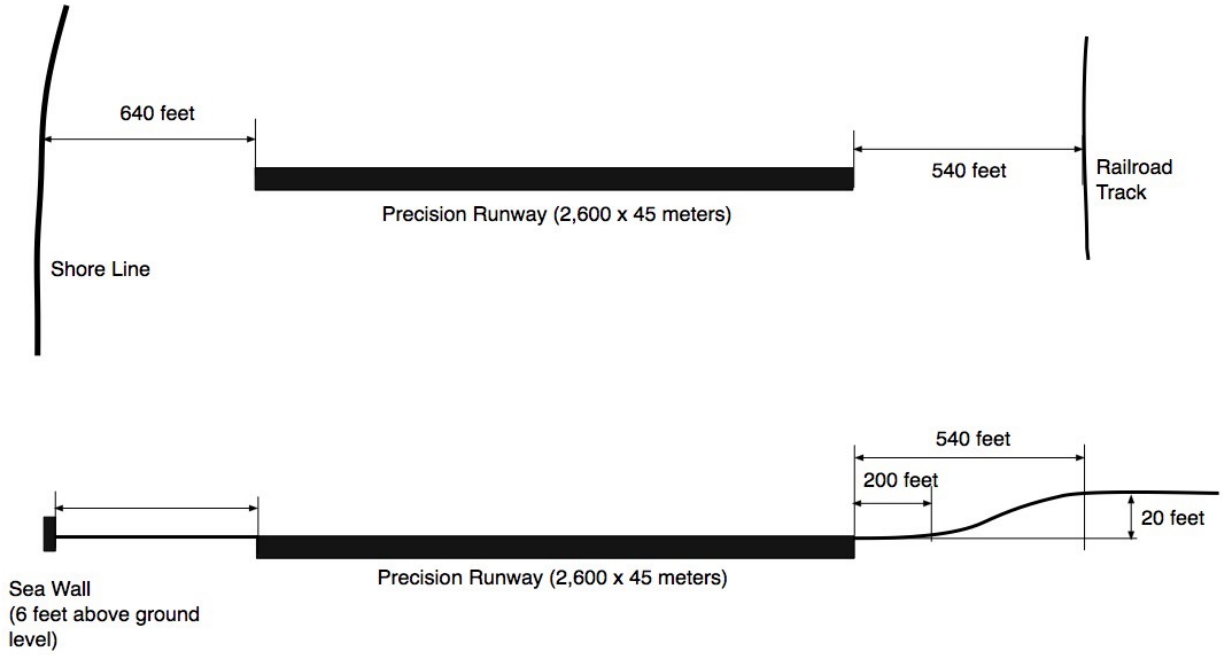

Figure 1. Existing Airport Runway for Problem 2.

The railroad adds another 23 feet to the elevation of the track. For a precision runway we have to check the following dimensions:

a) Approach surface (Table 3-2). This requires OCS of 34:1 from a point offset 200 from runway end (just like the FAR Part 77 approach surface).

7	Approach end of runways expected to accommodate instrument approaches having visibility minimums < 3/4 statute mile (1.2 km) or precision approach (ILS or GLS), day or night.	200 (61)	800 (244)	3,800 (1158)	10,000 [2] (3048)	0 (0)	34:1

b) Departure surface (Table 3-2) (see Figure 3-4). This requires OCS of 40:1. This OCS starts at the runway.

c) FAR Part 77 approach surface for a precision runway. Requires a slope of 50:1 for the first 10,000 feet (offset 200 feet from the runway).

The FAR Part 77 criteria (50:1 for precision runway) seems dominant and requires the railroad to be limited to 6.8 feet 540 feet form the runway as shown in the diagram. Since the railroad is 43 feet high, the starting point of the approach surface would have to be moved 2150 feet to the left in order to clear the 43 foot obstacle. This means the runway starts 2350 feet from the railroad track point. The runway threshold is (2350 - 540 = 1810 feet) from the physical starting point of the runway.

LDA distance requires a 1000 foot RSA at the left end of the runway (near seawall). Only 640 feet are available hence (1000-640 = 360 feet) is taken from the runway for LDA.

LDA = 8528 feet - (1810 feet) - 360 feet = 6,358 feet

For the ASDA we need to have 1000 feet at the far end of the takeoff runway.

ASDA = 8528 feet - 340 feet = 8,188 feet

c) Estimate the LDA if aircraft approach from the waters instead.

Here we have 600 feet prior to landing. However, we need 1000 foot at the far end of the runway.

LDA (left to right) = 8528 feet - 800 feet = 7728 feet

This solution assumes that the “hump” in the terrain at the far end of the runway violates the 5% slope allowed for the RSA. This can be checked because 340 feet remain between the flat section of the far end and the railroad track.

TODA and TORA = 8528 feet.

d) Based on your analysis, is there a need for a displaced threshold? Yes

Problem 3

An airport receives a request to build a Hangar to accommodate 2 Boeing 747-400 simultaneously (see Figure below). The hangar has a maximum height of the Boeing 747-400 plus an additional 15 feet for clearance and mounting of internal cranes to move heavy equipment inside the hangar.

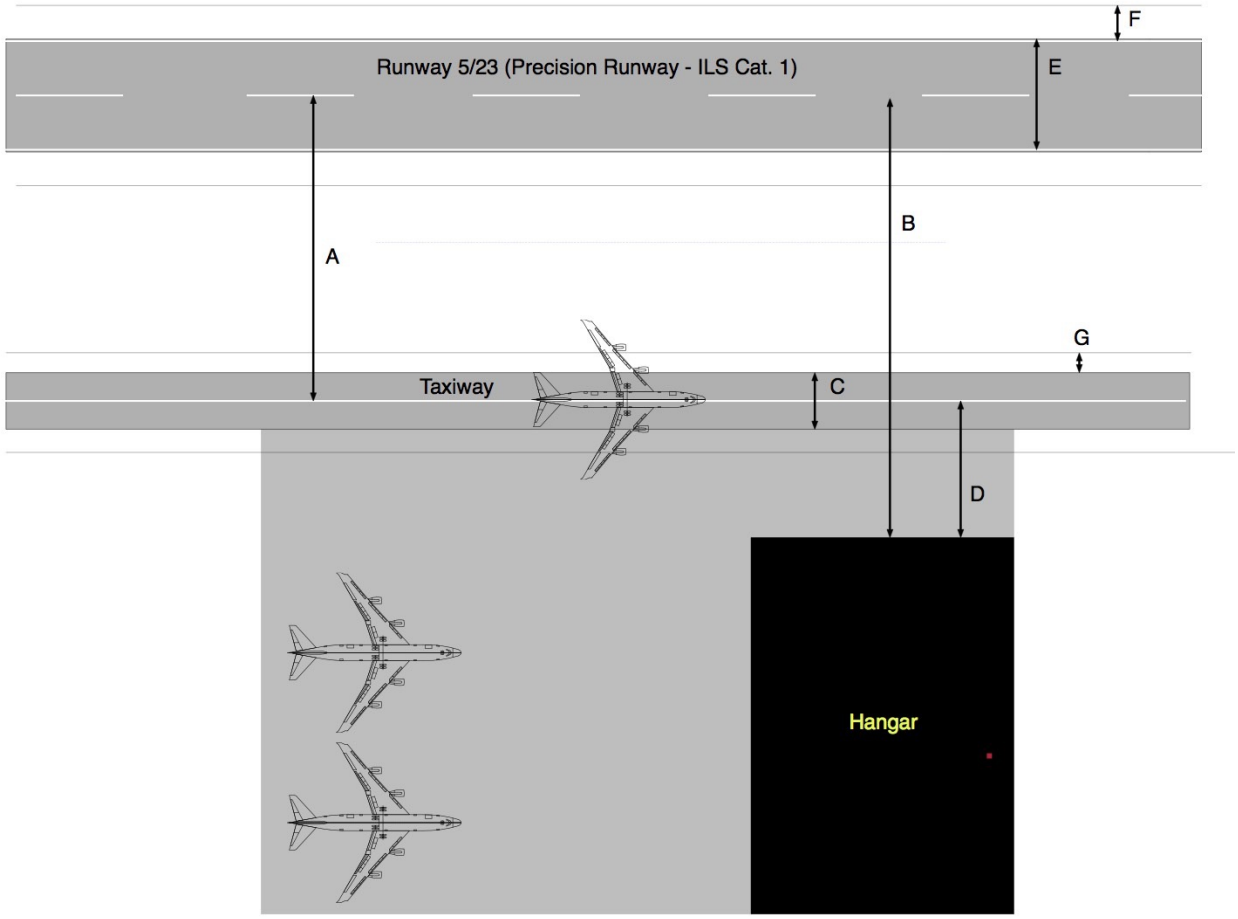

Figure 2. Proposed Hangar at Airport for Problem 3.

a) Perform the necessary analysis to determine the **minimum distance B** that will not violate the runway Obstacle Free Zone (OFZ) or other runway protection surfaces. Runway 5/23 is a precision runway with a Category 1 Instrument Landing System (ILS). State the dimensions of the OFZ for this runway.

Check Inner Transitional OFZ surface. H = 39 feet for Boeing 747-400 (213 feet wingspan). Assume sea level conditions. Flat section of OFZ is 400 feet (200 feet each side). This means the 79 foot hangar can be located 450 feet from the runway centerline using this method. This is shown in Figure 3.

b) Perform a separate analysis to determine if the proposed hangar location will not violate any of the 5 imaginary surfaces of FAR Part 77.

The transitional surface is critical. It raises 7:1 from a point 500 feet from the runway centerline. The minimum distance to the hangar is 1,053 feet (500 + 79*7).

c) Based on the two analyses above, what is the minimum distance to the hangar.

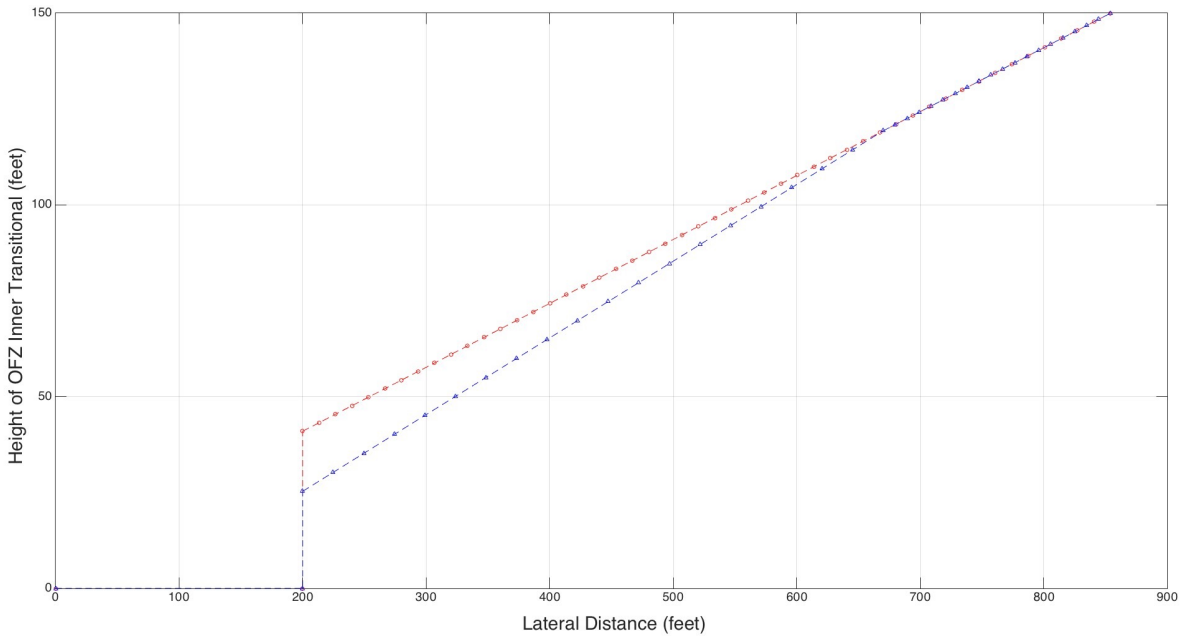

Figure 3. Inner Transitional OFZ. Point at (0) is the runway centerline. Red Line is the Cat. 1 Surface and Blue Line is the Cat II Surface.

Problem 4

A new airport is expected to serve regional airline operations using aircraft such as the Bombardier Dash 8-300 aircraft. The runway length needed has been estimated to be 1,400 meters. The airport is located at an elevation of 1,760 feet above mean sea level conditions. The airport will have a **non-precision runway** and serve approaches with visibility minima down to 1 mile. Determine the following dimensions for your design:

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

See Table 3-2 using type 3 runway.

Approach surface dimensions are: D=1500 feet, E=8,500 feet. Width dimensions are B (400 feet) and C (1,000 feet).

Departure surface dimensions are: 10,200 feet long. Width dimensions are B (100 feet) and C (6466 feet).

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

1910 feet above MSL