Assignment 7: Imaginary Surfaces and Airport Geometric Design Standards

Date Due: October 26, 2026
Instructor: Trani

Problem 1

This problem analyzes possible FAR Part 77 imaginary surface violations. The single runway airport has a 9,200-foot precision runway (see Figure 1). The objects identified near the runway are proposed by two developers and a telecommunications company.

a) Study the objects shown in Figure 1 and check if they violate any Part 77 imaginary surface. State the critical FAR Part 77 imaginary surface applicable to each object. Also, state if the objects are obstacles to navigation. Show your calculations.

b) Find if the communications tower, the data center or the antenna meet the instrument departure surface criteria. Show your calculations.

c) State the main difference between the Part 77 approach surface and the instrument departure surface for the precision runway.

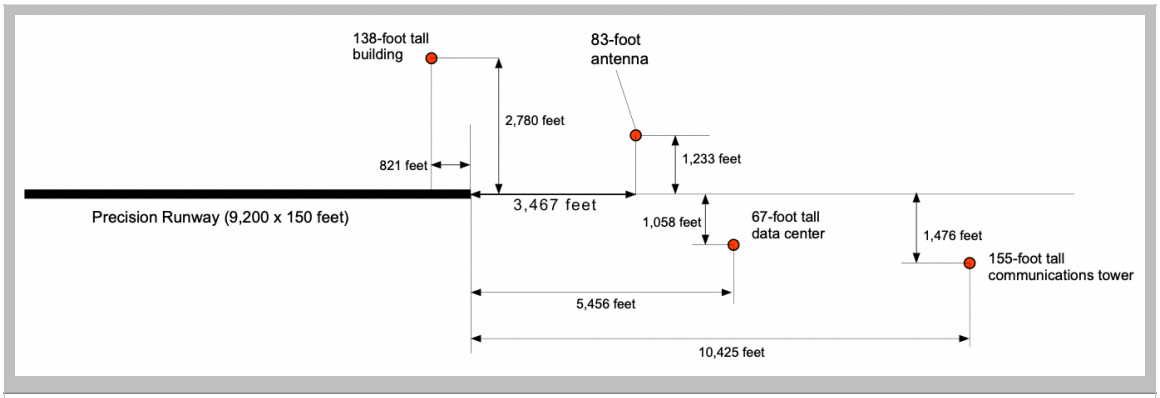


Figure 1. Objects Identified Near the Existing Runway. Drawing to Scale.

Problem 2

a) Use the **FAA Taxiway Fillet Design Tool** to design an odd 145-degree taxiway-taxiway connector for the Airbus A220-300 (see Figure 3). Your design should include all dimensions needed to construct the taxiway fillet (three segment lengths L-1, L-2, L-3; three taxiway widths W-0, W-1, W-2, W-3; and two radii dimensions R-Fillet and R-Outer. **Select a centerline radius to produce a maximum steering angle of 40 degrees.**

b) For the design aircraft, find the minimum centerline radius on the 145-deg. if the maximum steering angle is 50 degrees.

c) Use the **FAA FAA Taxiway Fillet Design Tool** to produce a simple CAD drawing of the taxiway-taxiway connector design in part (a). Show the detailed geometry in the CAD software with dimensions (no hand sketches accepted). You can export the DXF file produced by the FAA Taxiway Design Tool.



Figure 2. Airbus A220-300 at Atlanta Hartsfield-Jackson International Airport (A. Trani).

Problem 3

Perform geometric design calculations for a new international airport (see Figure 3). The idea is to provide eight gates that can accommodate aircraft up to the size of a Boeing 787-9 (see Figure 4).

a) Find the dimensions A through R in Figure 3. Make sure that your design allows pilots entering the gate position to maneuver with steering angles no more than 50 degrees. Assume the service roads have 12-foot wide lanes. Use the new design criteria to satisfy the taxilane object-free areas on the dual taxi lane. For dimension D, use the distance between the nose of the aircraft and the terminal building of a modern terminal like the LAX Tom Bradley International Terminal. For each dimension in your solution, state the criteria used.

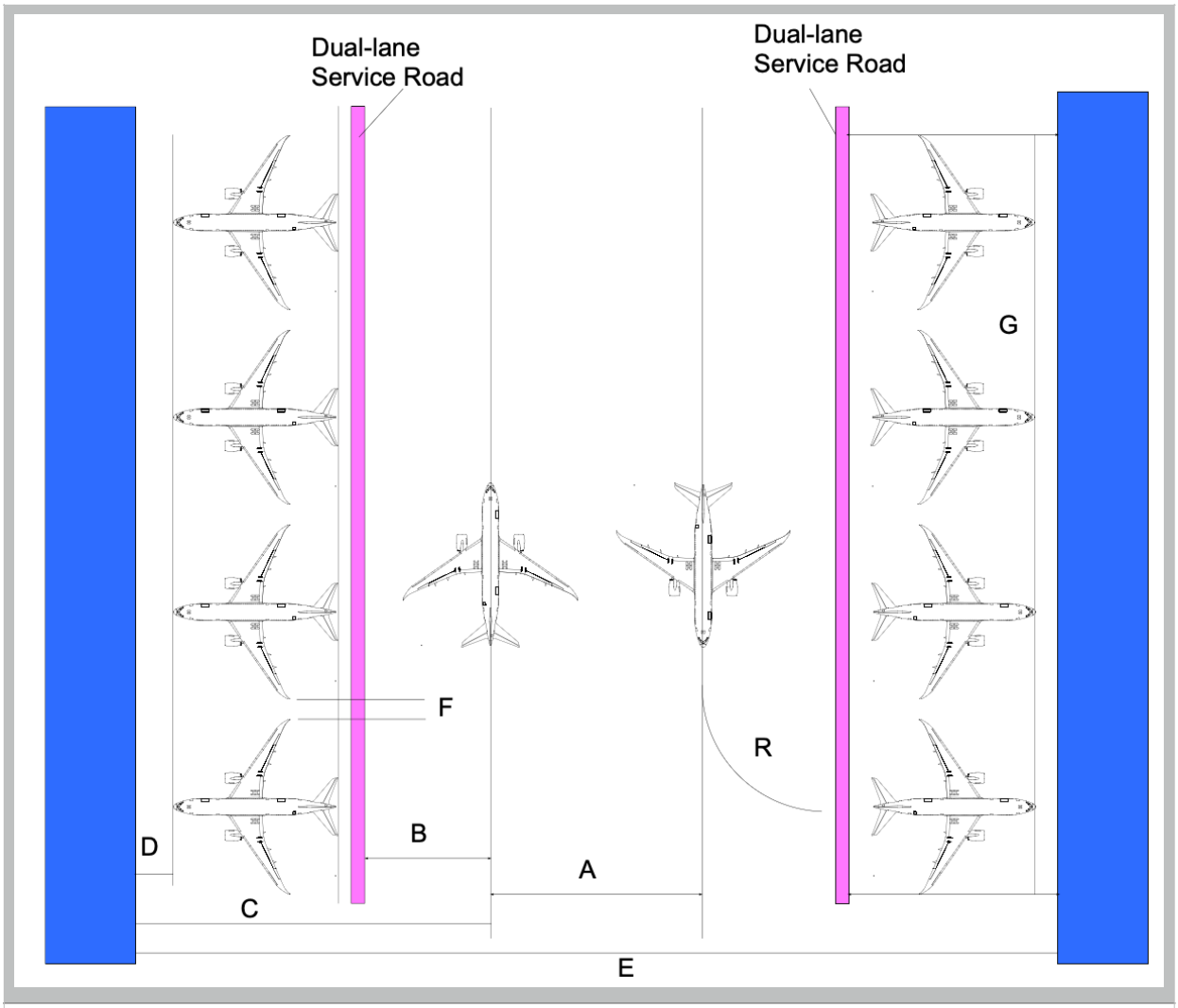


Figure 3. Airport Terminal Configuration for Problem 3.

b) Estimate the steering angle and wingtip radius of the Boeing 787-9 for the centerline radius R selected in part (a) of the problem. Consult Section 4 of the corresponding Boeing airport design and planning document.

c) Use the FAA taxiway design tool to track the centerline radius selected in parts (a-b) and the main gear of the Boeing 787-9 as it maneuvers to enter the gate. Export the CAD drawing and show me the nose gear and main gear tracks.



Figure 4. Boeing 787-9 at Atlanta International Airport (A. Trani).

Problem 4

An airport is expected to have two parallel taxiways to serve ADG IV aircraft taxiing in opposite directions. The airport is located at 2,300 feet elevation. Specify the following dimensions:

a) Distance between parallel taxiway centerlines.

b) Find the minimum distance between the taxiway centerline and a fix or movable object.

c) Find the dimension of the taxiway shoulder used in the design.

d) Find the taxiway edge safety margin used in the design.

e) State the dimensions of the Taxiway Object Free Area (OFA) and Taxiway Safety Areas (TSA).

f) Find the dimensions (length and width) of the runway blast pad area.