

Exam 2 - Take Home

Open Notes and Internet

Instructor: A.A. Trani

Due: December 5, 2025 at midnight

Instructions

Create a solution file using the word processor of your choice. Convert to PDF and submit to Canvas.

Include all screen captures of all your work, including aircraft manufacturer's tables and figures used, FAA tables used, and others. You will be penalized if you do not include the graphics of the information used to answer the question.

Honor Code Pledge

The information provided in this exam is my own work. I have not received information from another person while doing this exam.

_____ (your signature/name)

Problem 1 (30 Points)

- a) Obtain the San Diego International Airport Wind Data using the Mesonet website.
- b) Perform a wind rose analysis for the airport and determine the wind coverage operating both runways ends (09 and 27). The critical aircraft at SAN is the Airbus A350-1000 (see Figure 1). State the design crosswind component.
- c) Find the percent of time operations land and depart on runway 27 at SAN based on wind conditions. Assume zero tailwind allowance.
- d) Do you agree with the runway orientation at SAN? Comment.



Figure 1. Airbus A350-1000 landing at San Diego International Airport (A. Trani).

Problem 2 (35 Points)

This problem analyzes the runway capacity for San Diego International Airport when landing and departure operations use runway 27. The airport fleet mix is shown in Table 1. For this analysis, we use the following technical parameters: a) in-trail delivery error of 18 seconds under IMC conditions, b) probability of violation is 5%. Arriving aircraft are “vectored” by ATC to intercept the extended centerline of runway 27 at a fix (point in space) located 14 miles from the runway threshold.

Use the In-Trail Arrival-Arrival Separation Rules consistent with the Consolidated Wake Turbulence groups provided in class (i.e., FAA Order JO 7110.126B) to solve the problem. Use the departure-departure separations provided in class (taken from FAA JO 7110.126B). Use 10 seconds for departure-departure buffers to model pilot reaction time and jet engine mechanical lags.

Table 1. Runway Operational Parameters and Fleet Mix for Problem 2. Consolidated Wake Turbulence Groups.

Aircraft Consolidated Wake Turbulence Group	Percent Mix (%)	Runway Occupancy Time (s)	Typical Approach Speed (knots) from Final Approach Fix
B	6	62	145
C	5	59	143
F	76	51	136
G	13	52	125
Total	100		

- Estimate runway 27 arrivals-only capacity in IMC conditions. Please show me a couple of sample calculations for T_{ij} and B_{ij} (one for the opening case and one for the closing case). Also, please show two manual calculations of the gap (G) allowing one and two departures between successive arrivals.
- Estimate the departures-only capacity of runway 27 in IMC conditions.
- Draw the Pareto diagram (i.e., arrival-departure diagram) for the runway at San Diego.
- Compare your answer with the FAA published capacity at San Diego (https://www.faa.gov/sites/faa.gov/files/airports/planning_capacity/profiles/SAN-Airport-Capacity-Profile-2014.pdf). Comment.

Problem 3 (35 Points)

Answer the following questions briefly.

- Can Honolulu International Airport do simultaneous independent approaches in bad weather conditions? Comment on the FAA rule used and the state the runways that could be used for independent landing operations (if that is possible).
- During some periods of time, the Dallas-Fort Worth international Airport operates arrivals on runway 31R and departures on runway 35L. Is the configuration subject to Converging Runway Operations (CRO)? Explain the condition for CRO operations.
- Find the **maximum payload that can be carried by a Boeing 747-8F** (freighter with GENx-2B67 engines) with maximum takeoff gross weight of 975,000 lbs. (see Figure 2) using runway 31R at DFW. Use the DFW temperature design conditions. Consider 2035-2065 climate change temperature projections.



Figure 2. Boeing 747-8F (freighter) Departing Atlanta Hartsfield-Jackson International Airport (A. Trani).

- How far can the Boeing 747-8F fly with your payload estimate in part (c)?
- A telecom company proposes to build an antenna at the location shown in Figure 3. The 10,000-foot runway is a precision runway. Is the antenna an obstruction to navigation according to FAR Part 77 standards? Show me the calculations and state the surface in question.

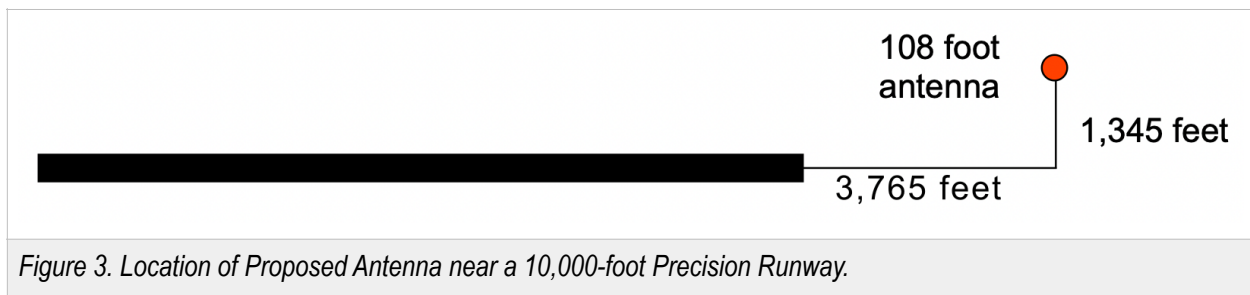


Figure 3. Location of Proposed Antenna near a 10,000-foot Precision Runway.

- Check if the antenna referenced in part (e) violates the **new runway siting criteria** considering the runway provides instrument departure operations. Show me the calculations.