Assignment 4

Date Due: September 27, 2023 Instructor: Trani

Problem 1

Before solving this problem, familiarize yourself with the FAA AC 150/5220-22B and review the course notes.

A reliever airport in California is evaluating the need for a runway arrestor system (EMAS). The airport has a 175-foot runway safety area at one runway end. The critical aircraft is a corporate jet similar in size to the Gulfstream III. The Gulfstream III is 1,500 lbs lighter than the Gulfstream G-350, shown in Figure 1. The airport has approach procedures with runway visibility minima of 1 nautical mile (RVR).

a) Find the RDC code for the runway design to accommodate the Gulfstream G-III. State all three parameters of RDC.

b) Find the size of the EMAS required to bring the runway end into compliance (i.e., legal RSA). State the recommended design exit speed used in your design.

c) State the standard RSA, ROFA, and RPZ dimensions for the Gulfstream G-III.

d) Read the FAA definition of airports (https://www.faa.gov/airports/planning_capacity/categories) and state the purpose of reliever airports.

e) Estimate the runway length needed at the airport using SARLAT 2 if the airport is located 1,860 feet above sea level and the design temperature is 28 degrees Fahrenheit above ISA conditions. In your analysis, use the Gulfstream 350 aircraft (similar in performance to the G-III) with 70% useful load.

Figure 1. Gulfstream G-350 Departs Virginia Tech Montgomery Executive Airport (A.A. Trani). The G-350 is 1,500 lbs. Heavier than the G-III. The G-350 uses More Efficient Engines (Rolls-Royce Tay).

Problem 2

Use Google Earth and review the EMAS systems installed on runway thresholds 5 and 23 at Charleston, West Virginia (CRW). The critical aircraft operating at CRW is similar in size to the Boeing 757 (see Figure 2).

a) Measure the runway 5 and 23 thresholds EMAS systems carefully. State the dimensions of each arrestor bed.

b) If the critical aircraft is the Boeing 757 (gross weight is 255,000 lbs.), estimate the EMAS design speed based on the arrestor bed dimension estimated in part (a).

c) Explain the reason for the EMAS systems installed on runways 5 and runway 23. Use Google Earth to view the elevation profiles past each runway threshold. Comment on what you see in those profiles.

Figure 2. Boeing 757-200 Landing on Runway 26R at Atlanta Hartsfield International Airport (A.A. Trani).

Problem 3

A site located 3,000 feet above mean sea level is proposed for a new international airport. The critical aircraft is the Airbus A330-900 with Rolls-Royce Trent 7000 Series Engines (see Figure 3). The airport's design temperature is ISA + 15 degrees C. The airline would like to fly routes requiring takeoff weights up to 235 metric tons. The airlines suggest a runway visibility minimum of 1/2 nm.

Figure 3. Airbus A330-900 at Atlanta Hartsfield International Airport (A.A. Trani).

a) Find the runway length needed to satisfy the design constraints.

b) Find the runway width, blast pad area, and runway shoulder width needed to support the Airbus A330-900.

c) Find the dimensions of the RSA, ROFA, OFZ (various components), and RPZ surfaces required for the Airbus A330-900. Assume the airport will have a Category I instrument landing system with visibility down to 1/2 mile. Make a table with your answers. Consult the FAA Runway Design Standards Matrix (https://www.faa.gov/airports/engineering/airport_design/rdsm).

d) Draw to scale (use Autocad or any CAD program of your choice) a plan view of the runway, RSA, ROFA, OFZ, and RPZ surfaces.

e) If the airport authority wants to build a new 67-foot-tall airport terminal 730 feet from the runway edge (perpendicular to the runway—see Figure 4), estimate whether the building violates the inner OFZ surface for Instrument Landing System Category I operations.