

Assignment 4

Date Due: September 26, 2022

Instructor: Trani

Problem 1

An airline wants to build a new 90-foot tall hangar 600 feet from the runway centerline of a 10,000 foot precision runway. The runway serves commercial aircraft including the Boeing 747-8I. The runway has a Category 1 Instrument landing system with visibility minima requirements down to 1/2 mile. **The airport elevation is 4,000 feet above sea level.**

- Create a table with dimensions (length and width) of the RSA, RPZ, ROFA and OFZ (all components) for the design aircraft.
- Does the hangar violate any of the four basic surfaces around the runway? Your analysis should include checking RSA, ROFA, OFZ (all components) and RPZ.
- If the runway has a High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2) (read short article at https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/lsg/als), find the size of the inner approach (OFZ) surface.



Figure 1. Boeing 747-8I at Chicago O'Hare International Airport (A.A. Trani).

Problem 2

Familiarize yourself with the FAA AC 150/5220-22B before trying this problem.

Review the configuration of Charleston, West Virginia Airport (CRW) using Google Earth and the Arnav database. Specifically, look at the the runway threshold 5. Due to a geotechnical engineering problem, a landslide destroyed the EMAS installed at the site on threshold 5.

- a) If an EMAS system is to be reconstructed on threshold 5, estimate the size of the arrestor bed if the critical aircraft operating at CRW is an Airbus A319 which is similar in size to the Boeing 737-400 contained in the EMAS document (see Figure below). Use the recommended EMAS design speed in your analysis.
- b) If the geotechnical engineering team decides that an EMAS bed cannot be no longer than 320 feet due to the steep slope characteristics at the site, estimate the maximum exit speed that such EMAS could protect against an overrun for the critical aircraft.
- c) Look at the declared distances for CRW runway 23 and tell me if the published LDA for runway 5 protects an aircraft against overrun at the end of landing runway. Be specific in your analysis. You can use Google Earth or Bing to measure the distances along the runway centerline.
- d) Are landings on runway 23 protected against an undershoot? To answer this question, consider (and state) the required RSA dimensions for the critical aircraft.
- e) Read the article (<https://www.flightglobal.com/pictures-crushable-concrete-cushions-crj-overrun-at-yeager/91521.article>) and tell me what kind of aircraft was involved in this accident. What is the size of the arrestor bed needed to stop the aircraft involved in the accident - assume the recommended design exit speed?



Figure 2. Airbus A319 of Spirit Airlines. Critical Commercial Aircraft Operating at CRW (A.A. Trani).

Problem 3

Look at the EMAS installed on runway threshold 4 at LaGuardia Airport (LGA). The critical aircraft operating at LGA is a Boeing 757-200 (see picture below).

- a) Measure the EMAS bed carefully. State the dimensions of the arrestor bed. Repeat the procedure for threshold 22.
- b) Estimate the maximum runway exit speed supported by the EMAS system installed at LGA runway threshold 4 considering the critical aircraft.
- c) Estimate the maximum runway exit speed supported by the EMAS system installed at LGA runway threshold 22 considering the critical aircraft.




Figure 3. Boeing 757-200. Critical Commercial Aircraft Operating at LGA (A.A. Trani).

Problem 4

The Master Plan 2020 for Roanoke/Blacksburg Regional Airport (ROA) airport states that in Phase II runway 6-24 will be extended to 7,700 feet with both ends protected by 1,000 foot RSA areas.

Future airlines may use the Boeing 737-8 (also called Boeing 737-8 Max) with characteristics shown in Table 1. For this analysis, use the latest version of the Boeing 737-8 Max documents for airport design (Revision G published on May 2022).

Table 1. Aircraft Considered in the ROA Airport Re-Evaluation. Picture Source: A.A. Trani.

Aircraft	Engine	Remarks
<p>Boeing 737-8 (Max) with CFM LEAP-1B28B1 engines. Aircraft maximum design takeoff weight is 179,800 lb. 178 seats in a two-class layout.</p> <p>Note: Boeing does not publish the operating empty weight (OEW) of the Boeing 737-8 Max series aircraft in the tables (all other Boeing aircraft publish OEW in the tables in Section 2 of the airport planning documents). However, The payload range diagram for this aircraft provides the value of OEW indirectly because the y-axis in the payload-range diagram is OEW + Payload. For the Boeing 737-8 Max the OEW is approximately 104,000 lbs.</p>		
		

- a) With the new runway in Phase II of the ROA Master Plan what is the maximum distance the airline could fly using the Boeing 737-8 Max?
- b) Will the airport support flights to the West Coast non-stop? For example flights to Los Angeles or San Francisco. Consider typical adjustments to the distance flown to account for weather and Air Traffic control deviations.

In your answers, clearly state the mean daily maximum temperature of the hottest month (design temperature), weights, and other considerations.

Problem 5

Use Google Earth (or Bing) and Airnav (www.airnav.com), to answer the following short questions.

Detroit International Airport (DTW)

- Can the airport conduct simultaneous approaches in Instrument meteorological conditions? State the two runways that can offer enough separation to conduct simultaneous approaches at DTW.
- Briefly explain the FAA rule used and the distance between the runways in question.

Chicago O'Hare International Airport (ORD)

- Can the airport conduct simultaneous approaches to runways 27R, 27L and 28C in instrument meteorological conditions? Briefly explain the rule used.
- Can the airport conduct simultaneous approaches to runways 27R, 27L and 28C in visual meteorological conditions? Briefly explain the rule used.

Use the Noise WebTrack 6 site (<https://webtrak.emsbk.com/cda>) to partially verify your answer to parts (a and b). The web site allow you to replay flight operations at an airport for the past six months.

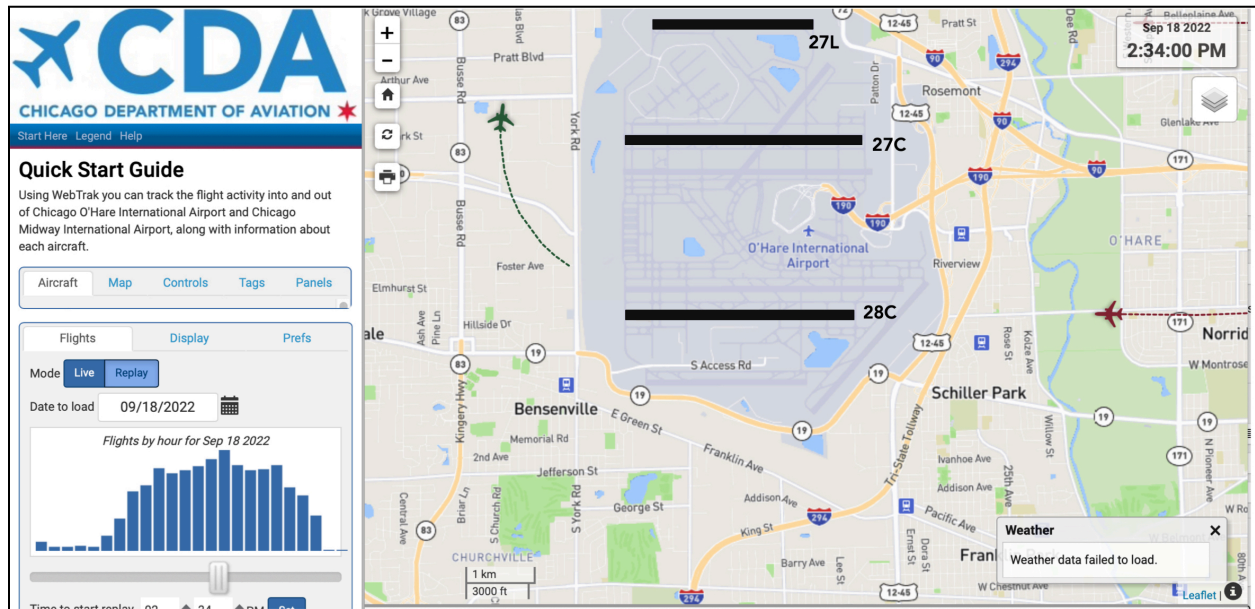


Figure 4. WebTrack 6 Display for Chicago Department of Aviation (CDA).