

Assignment 4

Solution

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Problem 1

Familiarize yourself with Chapter 6 of the AC 150/5300-13A before trying this problem.

Research in the internet and in Chapter 6 of the FAA AC 150/5300-13 the following airport systems. In a four sentence paragraph explain what is the purpose of the system and whether or not the system can be located inside the Runway Object Free Area (ROFA) and Runway Safety Area (RSA).

1. Automated Weather Observation System (AWOS)
2. Precision Runway Monitor (PRM)
3. Approach Lighting System with Sequence Flashing Lights (ALSF-2)
4. ILS Localizer Antenna (LOC) and ILS Glide-slope antenna (GS)
5. Very High Frequency Omnidirectional Range (VOR/TACAN)
6. Low-Level Wind Shear Alert System (LLWAS)

Problem 2

Use Google Earth software and Airnav (www.airnav.com) to answer the following short questions. Google Earth is used to inspect various airports across the country and perform some preliminary analysis.

For Baltimore Washington International Airport (BWI)

- a) Can simultaneous approaches be conducted on runways 33R and 33L in IMC conditions? Explain the FAA rule used and the distance between the two runways in question.

Runways are separated by 4,600 feet. Technically they are independent in IMC conditions. 4,300 feet required.

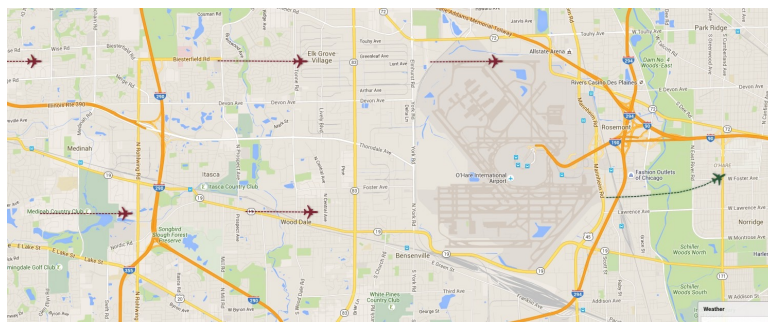
- b) Can simultaneous approaches be conducted on runways 33R and 33L in VMC and at the airport? Explain the FAA rule used and the distance between the two runways in question.

Runways are separated by 4,600 feet. 700 feet minimum if wake effects are not an issue.

For Chicago O'Hare International Airport (ORD)

- a) Can ATC conduct simultaneous approaches to two runways at ORD in IMC conditions? Explain the FAA rule used and the distance between the runways in question. Select the two most likely runways used for arrivals if the wind is blowing from the West and aircraft prefer to land against the wind. State the reason for your runway selection.

Yes. For example, during Eastflow operations ORD typically conducts simultaneous approaches to runways 9L and 10C as shown in the figure below (courtesy of <http://webtrak5.bksv.com/cda>). During Westflow operations the airport uses up to 3 simultaneous runways (27R, 27L and 28C) for arrivals.



b) Can ATC conduct simultaneous approaches to three runways at ORD in IMC conditions? Explain the FAA rule used and the distance between the runways in question.

Yes to runways 27R, 27L and 28C.

c) Can ATC conduct simultaneous departures from two runways at ORD in IMC conditions? Explain the FAA rule used and the distance between the runways in question. Select the two most likely runways used for departures if the wind is blowing from the West and aircraft prefer to takeoff against the wind. State the reason for you runway selection.

Two runways used for departures are: 28R and 22L (both runways are not affected by CRO rule).

For Memphis International Airport (MEM)

a) One day, the airport operates with arrivals approaching from the South (called Northflow operations since aircraft are flying in a North heading). Weather is IMC conditions. Select two runways to operate independent simultaneous approaches.

Runways 36R and 36L can be operated independently in IMC conditions (4,300 foot separation).

b) Can simultaneous approaches be conducted by two small aircraft on runways 36C and 36R in VMC conditions if wake is not a factor? Explain the FAA rule used and the distance between the two runways in question.

Yes, 700 foot separation required.

c) Can the airport operate arrivals on runway 27 and departures on runway 36L independently in VMC conditions? Explain the FAA rule that allows or disallows this procedure.

Problem 3

Use Google Earth application and your knowledge of runway safety areas to answer the following question. Figure 1 shows the configuration of two runways on the South side of LAX. Similarly, the diagram shows an Airbus A380 taxiing on taxiway "Hotel" to go to its gate.

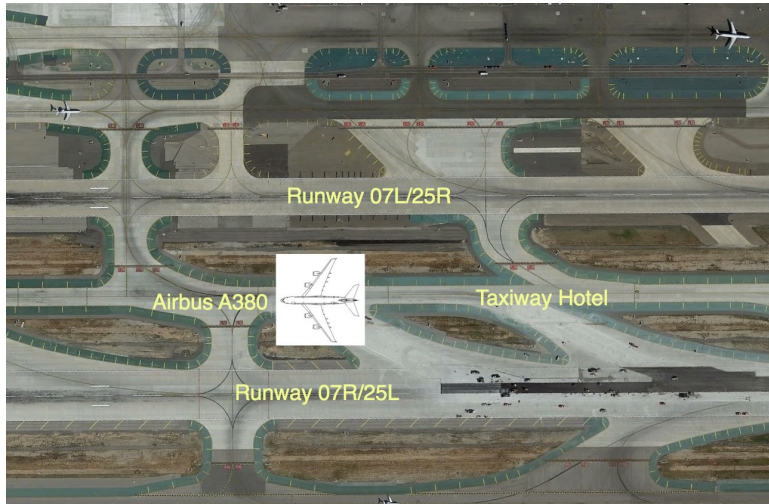
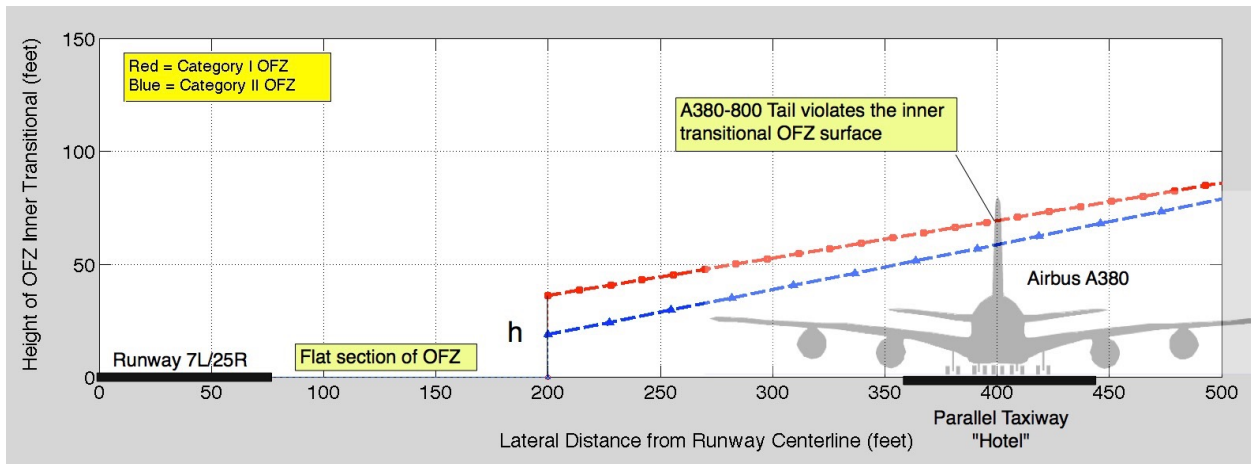


Figure 1. View of South Runways at LAX Airport.

- a) Estimate the dimensions of the OFZ for runway 7L/25R using the Airbus A380-800 as the critical aircraft. Assume runway 7L/25R has a Category I instrument landing system installed. Sketch your solution and clearly label the dimensions.



LAX Inner Transitional Surface for runway 7L/25R with Critical Object Shown.

- b) During IMC weather conditions, the airport tower instructs departure operations to use runway 25R and landings on runway 25L. If an A380 taxis on taxiway "Hotel", can departures be conducted on runway 25R without violating the runway OFZ? Explain

No because the tail of the aircraft violates the Inner Transitional OFZ surface of runway 7L/25R.

- c) For LAX, estimate the length of the RSA available for departures using runway 24L. Recommend possible some safety improvements.



Detail of Departure End of Runway 24L at LAX Airport. Note the 335 foot Displaced Threshold.

Using the Airbus A380-800 (C/D-VI), the critical aircraft RSA at LAX is 1,000 feet at the departure end. The dimensional standards are shown in the next table. Departures using runway 24L need to use the declared distance concept for now. Improvements could be to re-route the road at the end of the departure end of runway 24L.

RUNWAY PROTECTION

Runway Safety Area (RSA)

Length beyond departure end ^{10, 11}

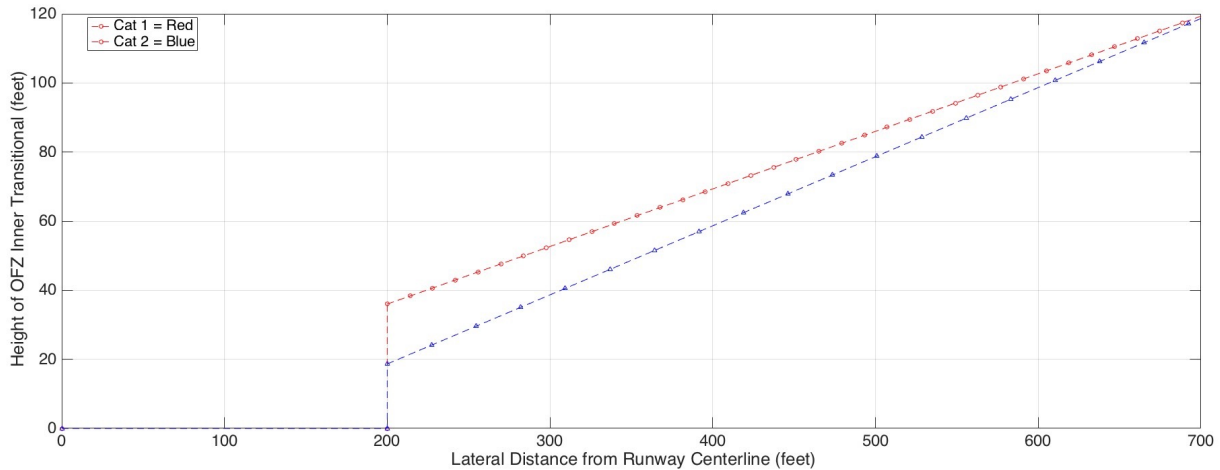
Length prior to threshold ¹²

Width

R
P
C

1,000 ft	1,000 ft	1,000 ft	1,000 ft
600 ft	600 ft	600 ft	600 ft
500 ft	500 ft	500 ft	500 ft

- d) A company wants to build a new A380 maintenance hangar 700 feet south of Runway 7R/25L. Estimate of the 95 foot tall hangar can be constructed and not penetrate the inner transitional OFZ surface.



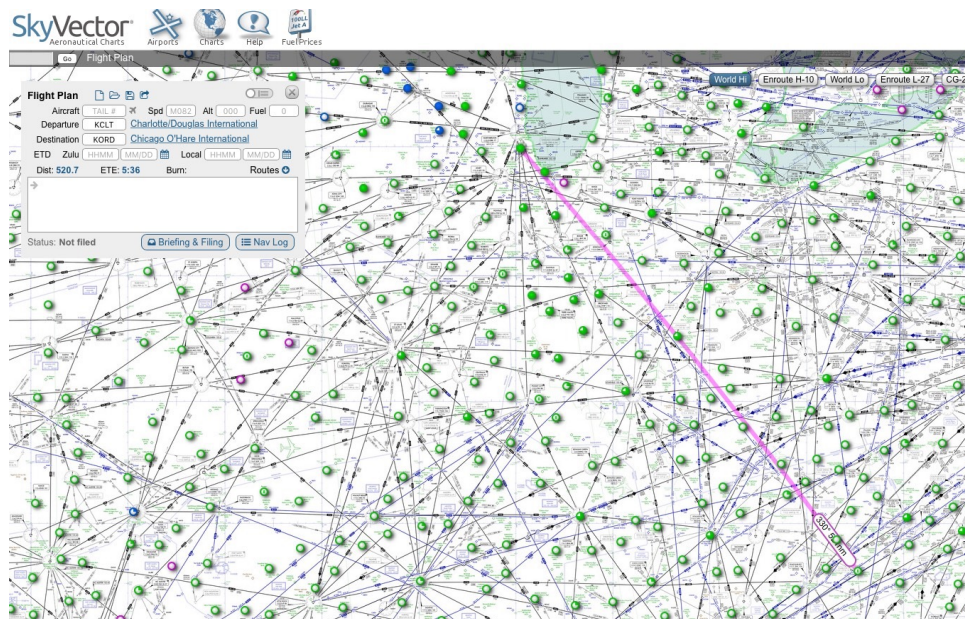
LAX Runway 7L/25R OFZ Surfaces (Category 1 and Category 2 Shown).

The minimum distance from the runway centerline would be 554 feet according to the OFZ constraint. Later we will see that there are other Building Restriction Line (BRL) constraints.

Problem 4

Briefly answer the following questions:

- a) An American Airlines departs Charlotte Douglas Airport (CLT) airport for Chicago O'Hare Airport (ORD). The pilot requests an initial altitude to be flown. Which of the two altitudes below is allowed for this flight?
 - i. 36,000 feet (for headings from 180 to 360 degrees) we fly even flight levels (even thousand altitudes). Flying from CLT to ORD requires the aircraft to fly a Northwest heading of around 330 degrees (see skyvector.com solution).



Direct Heading from CLT to ORD Airports. Source: skyvector.com.

- b) An aircraft traffic controller separates traffic in the Southern California TRACON. If two aircraft are located 24 nm from the radar antenna, what is the minimum horizontal separation used? Assume no wake vortex effects.

3 nm
- c) ATC controllers observe an aircraft flying at flight level 320 over Virginia. What is the altitude of this aircraft above sea level? What is the general direction of flight (i.e., North, South, East, West, lets.). Explain.

32,000 feet above mean sea level conditions.
- d) Using data from the FAA Aerospace Forecast 2014, explain the trend of the number of cargo aircraft in the US fleet in the last 10 years.

The number of cargo aircraft have decreased over the last decade. Cargo companies were affected by the recession. The cargo airlines retired numerous fuel inefficient aircraft like converted Boeing 727-200 and 727-100.
- e) Estimate the percent of paved runways in the US whose length is below 6,000 feet.