

Assignment 6: Air Traffic and Runway Operations

Date Due: April 6, 2022

Instructor: Trani

Problem 1 (Basic ATC and Runway Separations)

Answer briefly the following ATC-related questions.

- a) An Airbus A321 cruises at Mach 0.78 at FL 330 over Colorado. Name the ATC service used by the aircraft if the pilot requests a 10 mile deviation to the right to avoid weather.
- b) For part (a), is the aircraft flying East or West. Comment.
- c) Find the minimum separation between two runways able to operate simultaneous instrument landing procedure arrivals with a fast-scan radar.
- d) Use Google Earth and the FAA airport diagram to familiarize yourself with the runway configuration at DFW airport. Can runways 18R and 17C be operated independently for instrument approach arrivals? Comment on the rule used.
- e) Can DFW airport operate three simultaneous arrivals in instrument conditions? Name the runways selected in south flow operations.

Problem 2 (Long-Range Flight Operations)

Use Flightaware to examine flights between New York Kennedy Airport and Singapore International Airport (SIN). Specifically, review the flight plans of Singapore Airlines (SIA) Flight 23 departing JFK on March 19, 2022.

a) Compare the flight tracks of the flight with the return flight SIA 24 on March 20, 2022. Comment on the differences in travel time, flight track distance flown, and direction of the flights.

b) Comment on the different direction of travel for Eastbound flights between SIN and JFK.

Use the NOAA Re-analysis wind database (<https://psl.noaa.gov/data/composites/day/>) to answer the question. Specifically, look at wind vectors at 250 milliBar (FL 340 cruise altitude) to understand the wind conditions on the day of the flights. A sample query for wind vector data is shown in the figure below for March 20, 2022 (2022-3-20).

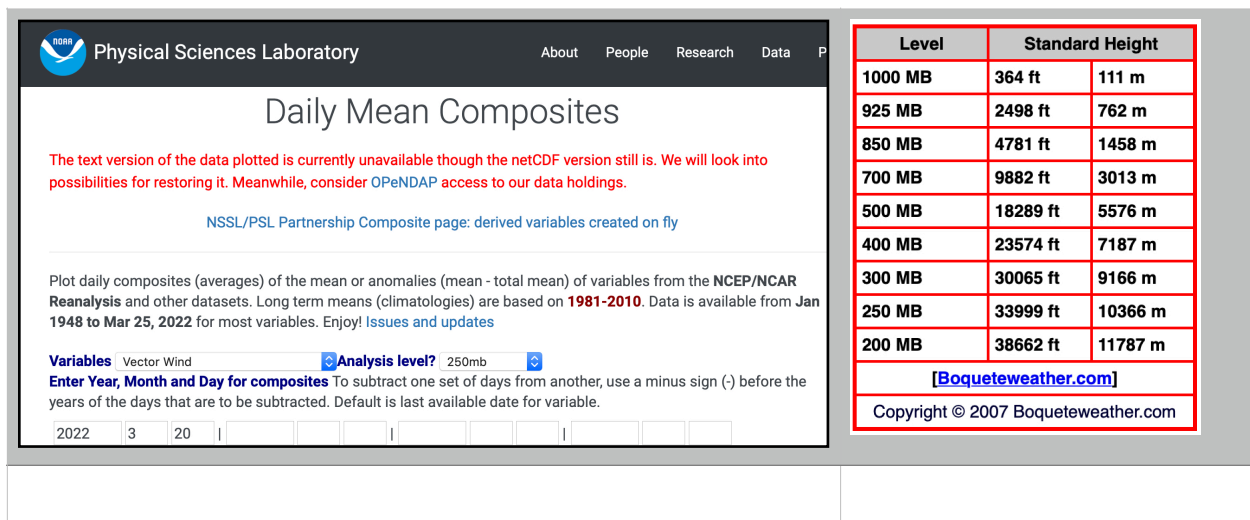


Figure 1. NOAA Re-analysis Wind Database. Conversion Table of Flight Levels to MilliBars to altitude (feet or meters). Source: https://www.boqueteweather.com/millibars_altitude.htm.

c) Use [seatguru.com](https://www.seatguru.com) to determine the seating configuration (see link below) for this flight and estimate the passenger payload carried. The airline uses an Airbus A350-900 ULR for both flights.

https://www.seatguru.com/airlines/Singapore_Air/Singapore_Airlines_Airbus_A350-900ULR.php

d) Consult the Airbus A350-900 planning data to estimate the performance of the aircraft with the payload estimated in part (c). Assume the aircraft operates at Maximum Takeoff Weight on the SIN-JFK route.

Link: <https://www.airbus.com/en/airport-operations-and-technical-data/aircraft-characteristics>. Estimate the runway length needed for a departure at maximum takeoff weight.

e) Given the conflict between Russia and Ukraine, what are the challenges in flight planning for the JFK-SIN route?

Problem 3 Air Traffic

Answer briefly the following ATC-related questions. Consult the aircraft classifications handout as needed.

- a) An Airbus A319 follows in-trail a Boeing 777-300ER before landing on runway 28C at Chicago O'Hare Airport (ORD). Find the minimum in-trail separation possible if the runway has several high-speed runway exits and the average runway occupancy time is 49 seconds. ORD operates under new consolidated wake separation rules.
- b) A Falcon 7X corporate jet follows in-trail an Airbus A350-900 aircraft before landing on runway 8L at Atlanta International Airport (ATL). Find the minimum in-trail separation possible if the runway has several high-speed runway exits and the average runway occupancy time is below 50 seconds. ATL operates under the new consolidated wake separation rules.
- c) During a period of time in the morning the airport receives aircraft similar to the Boeing 737-800 on runway 27R at ORD. If the ATC applies an 16 second buffer above the minimum radar separations, estimate the maximum hourly landing capacity of runway 27R at ORD International Airport.

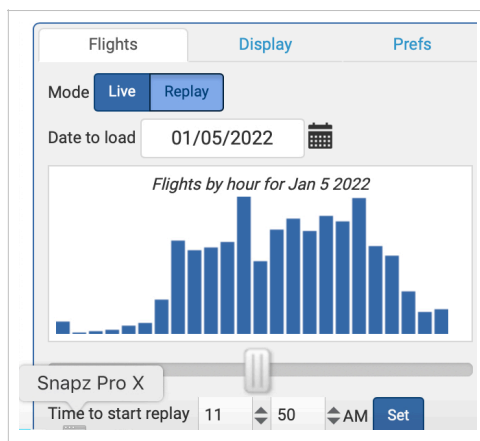
Problem 4

Figure 1 shows the interface of the Webtrak system for Chicago Department of Aviation (CDA). The system is available on the internet at: <https://webtrak.emsbk.com/cda>. Figure 2 shows the configuration of the airport in the WebTrack client. Use the replay feature of the Web Tracker to study the operations at ORD on January 5, 2022. Consult the airport map provided in Figure 3.



Figure 2. Webtrak system for Chicago Department of Aviation (CDA).

- a) Use the **replay feature** in Webtrak6 (see figure below) to estimate the total number of hourly landing operations (i.e., throughput) at O'Hare runway 27L between 11AM -12 PM (one hour time).



- b) Use the replay feature in Webtrak6 to estimate the total number of hourly departure operations at O'Hare runway 28R airport between 11AM -12 PM (one hour time).

- c) Observe the aircraft traffic departing on runway 22L and the arrivals on runway 27L during the period 11AM-12 PM. Explain what type of coordination is needed to operate these two runways.
- d) Explain the airspace organization to feed and meter arrival traffic to runways 27R, 27L and 28C. Are the arrivals independent of each other? Explain the FAA rule to operate triple independent arrivals.
- e) If the hourly arrivals and departures estimated in parts (a) and (b) represent maximum runway throughput or capacities, estimate the runway capacity of the airport in West flow configuration with arrivals on runways 27R, 27L, 28C and departures on runways 28C and 22L.

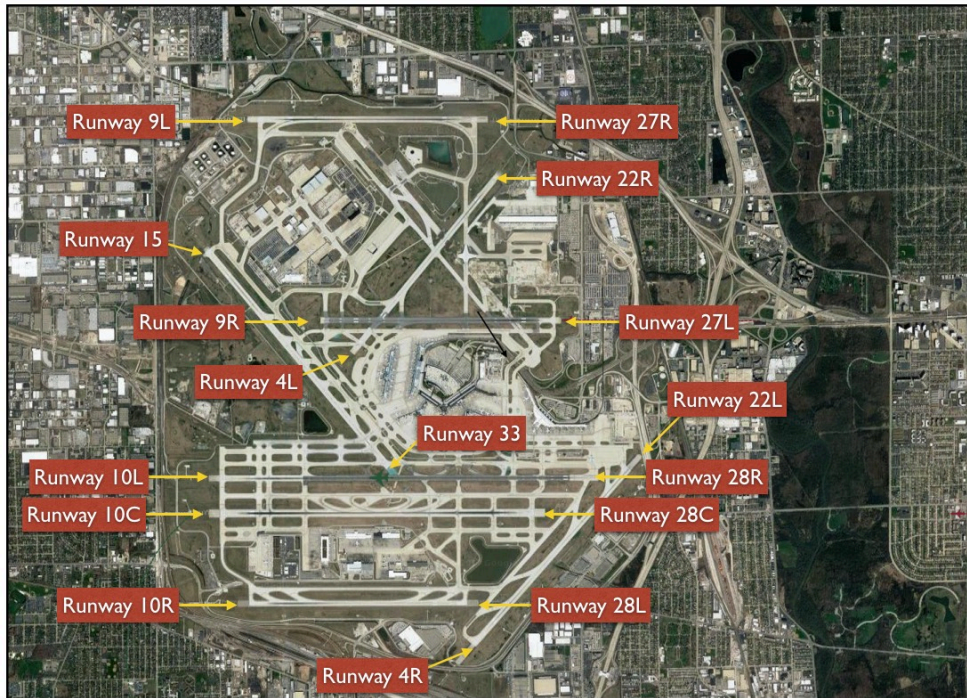


Figure 3. Chicago ORD Runway Configuration. Runway 15-33 was Decommissioned on March 29 2019.