

**Quiz 2: Take Home**

Date Due: December 9, 2011 (via email)

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**Problem**

The airport shown in Figure 1 is to be studied under VMC conditions. The airport has two runways used in segregated mode as shown in the diagram. Arrival traffic is metered and sequenced at two Nav aids called VOR1 and VOR2. For metering purposes, aircraft are required to cross the VORs at FL 220 and at about 380 knots (true airspeed). A sample scatter velocity profile measured at a similar airport in the U.S. is shown in Figure 2. Figure 2 shows the nominal speed vs. distance traveled profile for arrivals at a large hub airport in California. Figure 2 shows the runway located 78 nm from the point where aircraft are initially tracked inside the terminal area. Figure 3 shows the altitude vs. distance traveled profiles for the same airport. In your analysis use the nominal descent profiles (red lines).

The airport has an advanced airport surveillance radar (ASR) which tracks aircraft up to 80 miles from the airport site. To make the problem “simple”, assume that all traffic operating at the airport is **Large jet** traffic. Such aircraft require a minimum separation between successive arrivals of 3 nm under IMC conditions and 2.5 nm under VMC conditions. Assume the ATC probability of violation is 5% with standard deviation of the in-trail delivery error at 12 seconds due to the installation of a PRM radar. The arrival runway occupancy time is 60 seconds and the minimum departure-departure separations are 75 and 60 seconds under IMC and VMC conditions, respectively.

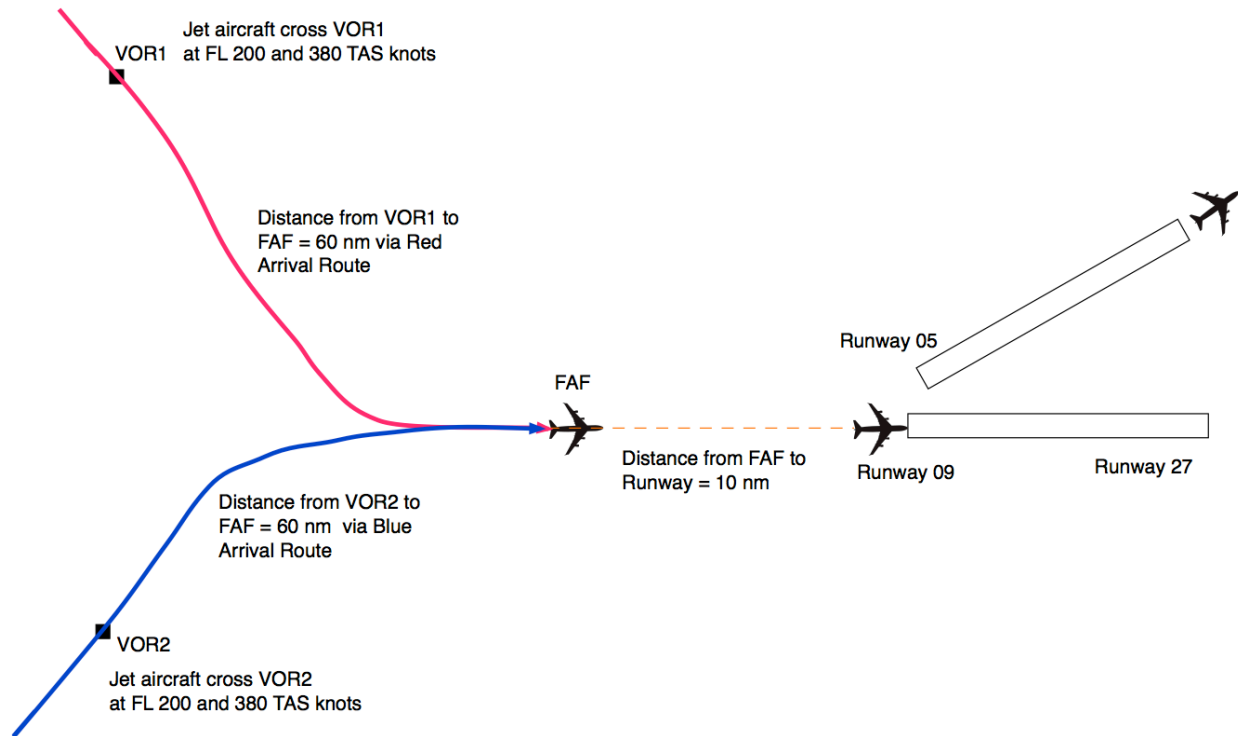


Figure 1. Runway configuration.

- Find the saturation arrival capacity of the airport under VMC conditions.
- Find the saturation departure capacity of the airport under VMC conditions.
- Draw the VMC Pareto diagram for the airport under VMC conditions.
- Estimate the in-trail separations required at VOR1 and VOR2 to match the saturation capacity of the runway under VMC conditions. State the desired aircraft separations at VOR1 and VOR2 in nautical miles and also estimate the headways in seconds (i.e., times between successive arrival). Assume the traffic per hour using the blue and red routes in one hour is split 55/45%.
- If the traffic is heterogenous and made up of turboprop and jet traffic, how would you approach the problem (do not solve). Clearly state your approach. Use flowchart, diagrams, etc. as needed.
- How would an airport like this one benefit using proposed NextGen technologies? State what model parameters that are likely to change under NextGen and also state the NextGen technologies that responsible for parameter changes.

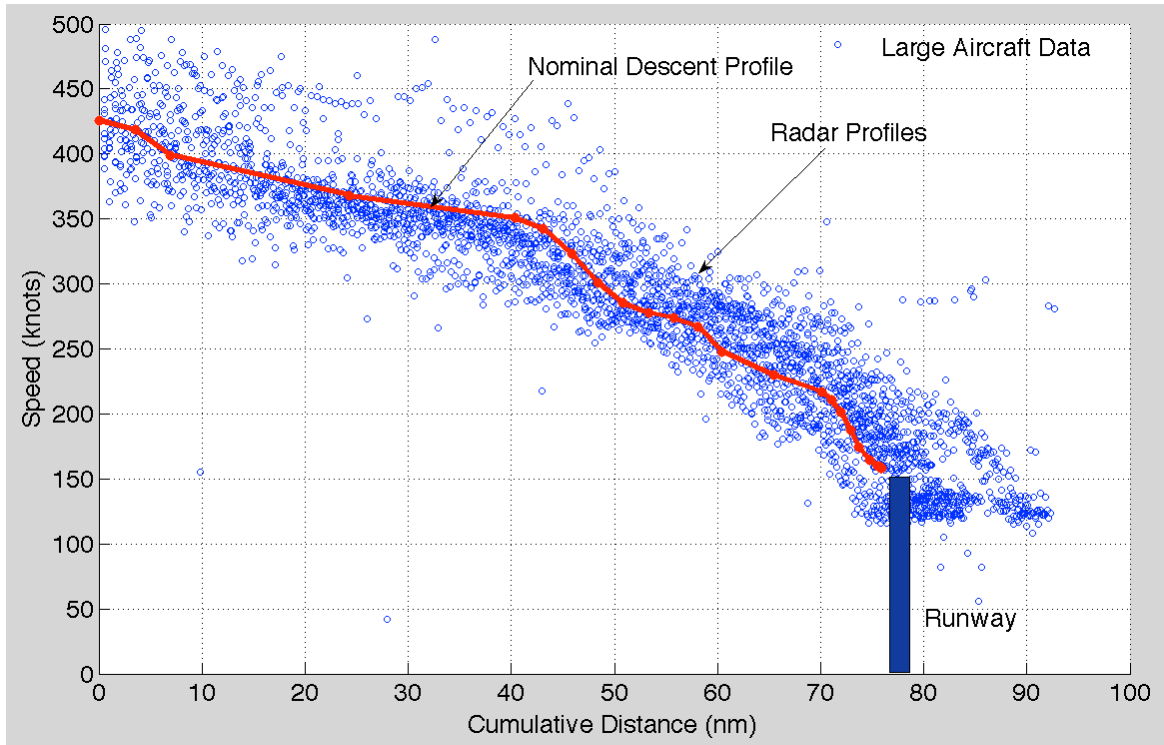


Figure 2. Radar velocity profiles. Speed shown is true airspeed.

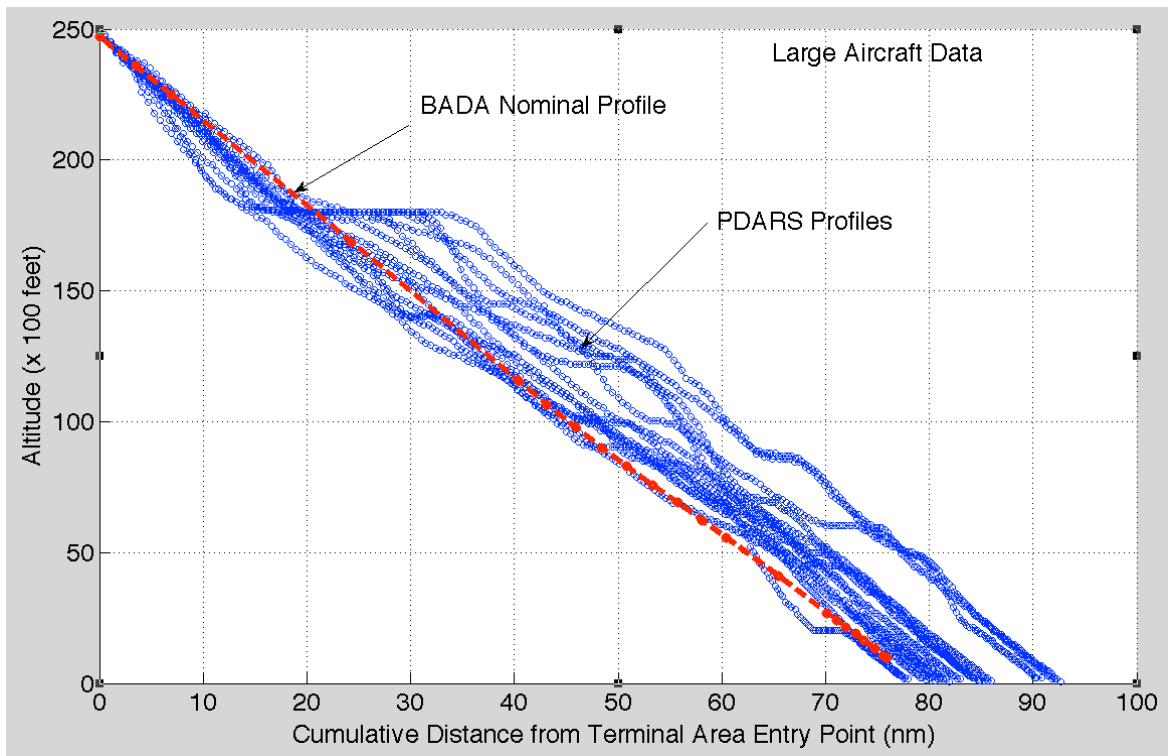


Figure 3. Nominal and observed descent profiles.