

Assignment 2: Basic Runway Length Calculations

Date Due: February 5, 2015

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Problem 1

A new airport in the State of Wyoming is planned to serve general aviation aircraft and corporate jets weighting less than 30,000 lb. (this includes a few light business jets such as the Cessna Citation VII and the Falcon 20). The site location is 4,900 ft. above sea level. For the design temperature assume that the airport will be located near Glenrock, WY. The airport is also expected to serve small single-engine piston powered aircraft.

- Find a suitable runway length to operate all aircraft safely.
- Repeat the analysis of part (a) for temperatures +/- 15 deg. F from those applicable to Glenrock. From your analysis, what would the correction needed to estimate runway length a function of temperature? For example for every 1 degree above the nominal temperature, the runway length increases y percent.
- If this airport had been located at sea level under (ISA + 10 deg. F) conditions,, what would be the runway length needed?

Problem 2

- Explain in simple terms the effect of temperature on the performance of aviation engines, specifically on turbofan engines. Use this explanation to show the effect of temperature on runway length requirements.
- Explain in simple terms the effect of airfield elevation on the performance of the aircraft and its effect in runway length requirements.
- Why is the aircraft takeoff speed higher at a high altitude airport? Explain using the lift equation or the stall speed equation.

Problem 3

Using the World airport database linked in our web site (<http://worldaerodata.com>), collect data about the longest runway length and airfield elevation for the following international airports: Katmandu Tribhuvan International Airport (KTM), Mexico City International (MEX), Lhasa Gonggar Airport (LXA), Charlotte International Airport (CLT) and Phoenix (PHX).

- Plot the longest runway length vs airfield elevation. Is there a trend in terms of runway length vs. airfield elevation? Comment.
- Why would an airport like New York Kennedy must have one very long runway (like runway 31L)? Answer the question by looking at the Boeing or Airbus documents for Boeing 747-400 or Airbus A380 takeoff performance charts.

Problem 4

- Estimate the runway length needed for a group of aircraft represented by the Pipistrel Virus SW 100 (<http://www.pipistrel.si/plane/virus-sw/technical-data>). The airport elevation is 3,400 feet above mean sea level conditions.
- Find the runway length for a grass runway designed for ultralight aircraft. The airport will be near Christiansburg, Virginia.
- Under what airport operating conditions do we need to consult airplane manufacturer data for aircraft in the category (< 60,000 lb and > 12,500 lb)? Give an example.