Assignment 3: Runway Length and EMAS Design

Date Due: February 12, 2015   Instructor: Trani

Problem 1

A new airport to be constructed in the State of Vermont would like to request your services to estimate the runway length requirements to support regular operations using the aircraft shown in Table 1. The new airport is to be located in a 3,200 acre parcel located 1,000 feet above sea level conditions. The new airport will be near Burlington, VT. Use the design temperature for Burlington, VT in your analysis.

Table 1. Aircraft for Airport in Problem 1.

Aircraft	Engine	Remarks
Boeing 747-8F 987,000 MTOW Freighter aircraft	GEnx 2B engines	To be used in routes of up to 5,000 nm to Alaska and Eastern Europe
Boeing 757-200 230,000 MTOW Passenger aircraft	Rolls Royce RB211-535C Engines	To be used in routes of up to 2,500 nm to the US West Coast

a) Find the runway length needed to operate both aircraft in the types of routes stated in the table. Use standard two-class cabin configurations stated in the Boeing APM documents (when applicable). Factor in 3,000 kg of belly cargo for the Boeing 757-200 and as much cargo as practically possible for the Boeing 747-8F freighter. Decide the runway length for the new airport. In your solution state the figures used in the Boeing APM documents.

b) Find the dimensions of the runway safety area, runway protection zones, object free areas and obstacle free zone (including dimensions of the inner transitional surface) for a the single runway at the new airport. The new runway is expected to have a Category I Instrument Landing System (ILS) with decision height of 200 feet.

c) Draw all 4 basic runway protection areas to scale using Autocad or any drawing program of your choice (just planview).

d) The airport client wants to build a 60 foot tall terminal building 650 feet from the runway centerline. Does the proposed location violate the OFZ surface of the airport? Explain.

Problem 2

The San Diego International Airport would like to request your services to estimate the runway length requirements needed to operate a new nonstop service San Diego to Tokyo Narita Airport (Japan) using Boeing 777-300ER. The airline in question has Boeing 777-300ER powered by two *GE90-115BL engines* rated at 115,300 lb. of thrust.

a) Find the route distance from San Diego (SAN) to Narita (NRT). Use a 5% detour factor above the Great Circle Distance (GCD).

b) Find the runway length needed to operate this non-stop service from SAN. Assume the aircraft has a two class configuration and you would like to provide maximum flexibility to the airline.

c) Look at the existing runway conditions at SAN. Do you need a runway extension? Comment.

d) With the existing runway and full passengers (no cargo) how far can the Boeing 777-300ER fly under the design temperature conditions? Explain.

Problem 3

La Guardia Airport is exploring the installation of an Engineered Materials Arresting System for several runway ends. Use Google Earth to identify the situation.

 a) Find the length of the EMAS system to contain a Boeing 757 departing DCA and complying with FAA runway safety standards. Refer to FAA AC 150/5220-22A available on our home page. Use the recommended FAA design speed for EMAS systems.

 b) Can the proposed EMAS installed in the available RSA for runway ends 13 and 22? Explain.

 c) Given the dimensions of the EMAS constructed at runway end 31, estimate the maximum speed of a Boeing 757 that could be contained with the existing EMAS length. Explain your analysis.