

## Assignment 3: Runway Length and EMAS Design

Date Due: February 14, 2014

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### Problem 1

A new airport to be constructed near Mexico City airport 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 6,500 acre parcel located 7,250 feet above sea level conditions. The design temperature condition for Mexico City is 82 deg. F.

Table 1. Aircraft for Airport in Problem 1.

Aircraft	Engine	Remarks
Boeing 737-700 70,307 kg MTOW	CFM56-7B20/-7B22/-7B24 developing 20,000 lb of thrust at sea level	To be used in routes of up to 2,500 nm to Central America destinations i
Boeing 787-8 227,930 kg MTOW	GE Engines Genx (High thrust engines)	To be used in routes of up to 5,000 nm to Europe. Plane has 242 seat three-class configuration

- a) Find the runway length needed to operate both aircraft in the types of routes stated in the table. Use standard three-class cabin configurations stated in the Boeing APM documents. 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 for one of the runways found in part (a). The new runway is expected to have a Category I Instrument Landing System (ILS).
- c) Draw all 4 basic runway protection areas to scale using Autocad or any drawing program of your choice (just planview). Estimate the dimensions of the OFZ surface.
- d) An airline wants to build a 83 foot tall hangar to accommodate the Boeing 767-200 at the site. The proposed hangar wall will be located 850 feet from the runway centerline. Does the proposed location violate the OFZ surface of the airport? Explain.

### Problem 2

The Lehigh Valley International International (ABE) would like to request your services to estimate the runway length requirements needed to operate a new nonstop service from Lehigh Valley to Moscow using Boeing 777-200LR. The airline in question has Boeing 777-200LR powered by two *GE90-115BL engines* rated at 115,300 lb. of thrust.

- a) Find the route distance from Lehigh (ABE) to Moscow. Use 5% the detour factor.
- b) Find the runway length needed to operate this non-stop service from ABE. Assume the aircraft has a two class configuration and you would like to provide maximum flexibility to the airline.
- c) Do you need a runway extension at ABE? Comment.

### Problem 3

A new international airport is exploring the installation of an Engineered Materials Arresting System (EMAS).

- d) Find the length of the EMAS system to contain a Boeing 747-400 (or equivalent) departing the new airport. Refer to FAA AC 150/5220-22A available on our home page. Use the recommended FAA design speed for EMAS systems.

e) Why are the dimensions of the EMAS different for various aircraft? Explain using your knowledge of Physics.

## **Problem 4**

Use Wikipedia to learn the details of the following landing systems:

- a) Explain in two paragraphs the what is the purpose and the components of the Instrument Landing System (ILS).
- b) Explain in two paragraphs what is the purpose of the Ground Base Augmentation System (GBAS system) and how it compares to the ILS system.