Assignment 6: ETOPS and BADA

Date Due: October 16, 2020   Instructor: Trani

Problem 1

Use the data for the transport aircraft similar to the Boeing 787-8 (http://128.173.204.63/courses/cee5614/cee5614_pub/boeing787_class.m) to answer the following questions.

The aircraft is in cruise at FL 350 with a mass of 207,700 kgs and the fuel available at that point for cruise is 60,000 kilograms.

a) If the aircraft has an engine failure at the point in question, estimate the best altitude and Mach number to divert to an alternative airport. Explain your selection.

b) The closest alternative airport selected in the flight plan is located 1,300 nm from the engine failure point. Assume no wind conditions and ISA atmospheric conditions in the calculation. Estimate the travel time to the alternate airport and state if the flight can be operated as an ETOPS 240 (minutes) flight. Assume the alternative airport is at sea level.

c) Repeat the analysis if the aircraft has a pressurization failure. Clearly state what is different. Also state what is the new speed and altitude under the pressurization failure. Assume both engines are working.

Problem 2

Read Chapter 15 of the Pilot's Handbook of Aeronautical Knowledge (https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/pilot_handbook.pdf) and answer the following questions:

   a) Briefly explain the difference between Class B and D airspace.

   b) Briefly state the requirements to operate in Class A airspace.

   c) Check with Flightaware or Flightradar24 the typical cruise altitudes for flights from ROA to IAD. State the types of airspaces (class A-G) the flight will use.

Problem 3

Use skyvector.com to plan a flight between MIA and LHR (London heat row) airport. The pilot files the following route including intermediate waypoints:

Origin airport - MIA

Intermediate waypoints - ZFP SNAGY LEXIM PERDO BOBTU ADARA LEDGO ODADA ADKIK
Destination airport - LHR

a) Estimate the total distance for the flight as filed in the flight plan.
b) Compare the distance filed in the flight plan with the Great Circle Route (shortest distance between two points on the sphere).
c) If the aircraft flying the route is a Boeing 747-8 cargo plane flying at FL 350 (see page 164 of the Performance Notes 2), estimate the additional fuel used in the route filed. For this problem assume the additional fuel used is just the fuel burn in cruise times the additional time in cruise.

Use the typical cruise speed at FL350 suggested by BADA in the OPF file. Assume nominal aircraft mass.

Only for CEE 5614 Students

Problem 4

Use the BADA model data for the Boeing 747-8 (see page 164 of notes - aircraft performance 2) to answer the following question:

   a)   Estimate the fuel burn for the aircraft on the approach phase of flight (Flaps 20 degrees) using the BADA parabolic drag polar (called F20 on page 160). The aircraft is descending at 220 knots Indicated Airspeed and 5,000 feet. Assume ISA conditions. Show your calculations. Note: in the approach phase, the cruise correction factor is not needed.