

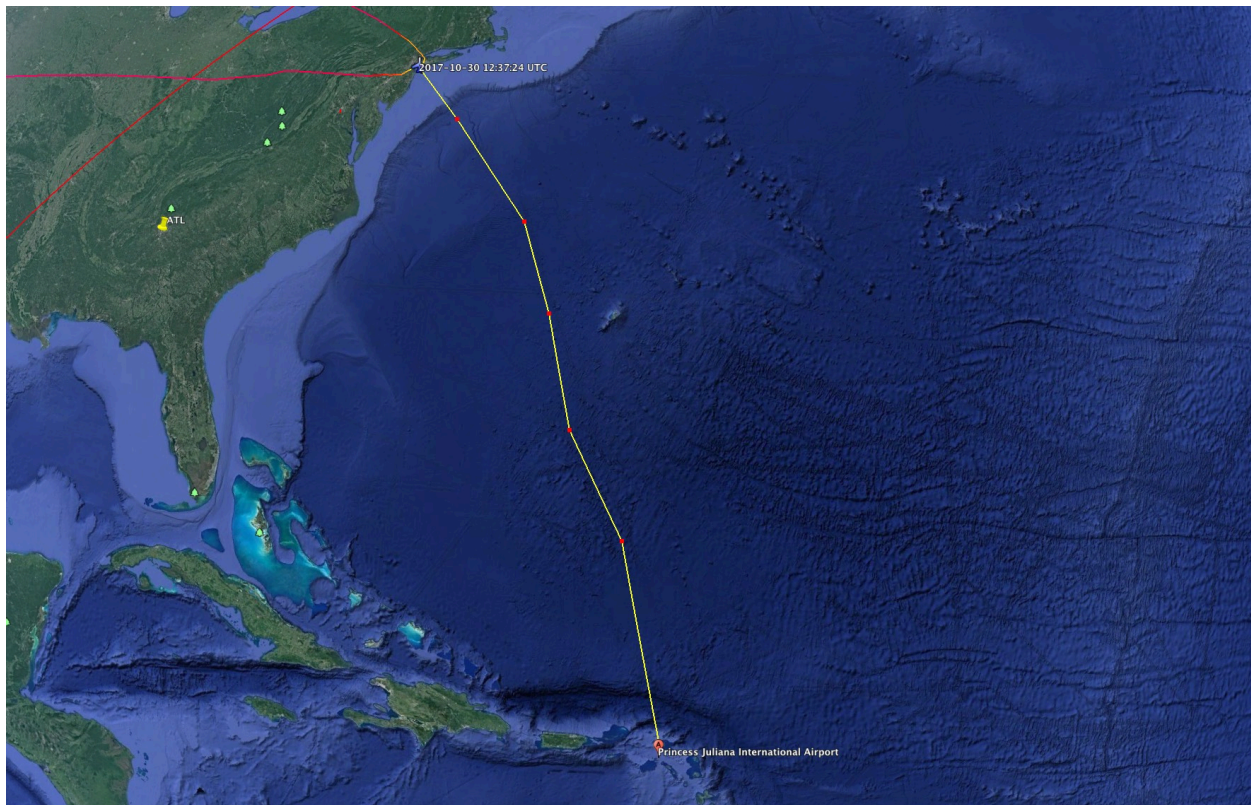
Assignment 5: Air Transportation Systems

Analysis Date Due: February 20, 2018

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Problem 1

To do this problem, use the Boeing 737800 class aircraft file from the web site (http://128.173.204.63/courses/cee5614/cee5614_pub/Boeing737800Jet_class.m). An airline plans a flight from St. Martin (SXM) to New York (JFK) using the selected aircraft (see graphic).



- Use the `unrestrictedClimbAnalysis.m` Matlab script to estimate the mass of the aircraft at the Top of Climb (TOC) point. The aircraft takeoff weight is 74,000 kg. with 20,000 kg of fuel. Use the default climb speed profile provided in the aircraft data file. Use ISA+20 atmospheric conditions in your climb calculations. Select the TOC altitude so that the aircraft at the TOC point has an initial 500 ft/min climb capability.
- Use the `unrestrictedDescendAnalysis.m` Matlab script to estimate the fuel used from the Top of Descent (TOD) point to the destination airport. For an initial iteration assume the aircraft starts its descent from 34,000 feet to JFK. Estimate the descent distance (assume ISA conditions for the descent).
- Estimate the fuel used in cruise for this flight if the airline dispatch recommends Mach 0.78 for the cruise Mach Number. Assume the cruise altitude does not change.
- Estimate the fuel used in cruise if the aircraft is allowed to climb once at a point 800 nm from the TOC point. Following air traffic control rules, the climb needs to be 2,000 feet because we comply with so-called hemispherical rules.

Problem 2

This is a continuation of Problem 1.

- a) If the aircraft has an engine failure at a point 500 nm from the TOC point, estimate the best altitude and Mach number to divert to an alternative airport. Explain your selection.
- b) Identify two feasible airports that can be used as diversion airports (other than the departure airport).
- c) If another aircraft is certified for ETOPS 60 (minutes), can the aircraft fly this route? Explain.
- d) If the pressurization system fails at point (a), find the fuel consumption (in kilograms/hr) at the new cruise condition (state the altitude used). Assume the speed after pressurization failure is no more than 275 knots (indicated).
- e) Can the aircraft continue to New York after the pressurization failure? Explain.

Problem 3

Refer to the sample problem demonstrated in class for the Boeing 767-300 (see performance notes 2 - page 180).

- a) Find the fuel consumption for the aircraft while cruising at 36,000 feet and Mach 0.81. Assume the aircraft has a mass of 161,000 kilograms.
- b) if the aircraft above used by an airline is certified for 138 minutes ETOPS, can the aircraft fly the route HNL-NRT if 390 knots is used as the single engine speed? Explain.