AOE 3104 Performance Problem Sheet 9

Due April 16, 2003

Read Marchman Chapter 6

The problems on this sheet deal with an aircraft with the following properties:

W = 600,000 lbs	T_max~=~180,000 lbs	S = 5128 ft^2
$C_{D_{0L}}$ = 0.017	K = 0.042	$C_{L_{max}}$ = 2.2
TSFC = 0.85 (lbs/hr)/lb	W_f = 180,000 lbs	

46. Find the range (in miles) flown under maximum range flight conditions (at least at the beginning of the flight), assuming the flight starts at 10,000 ft. for the case where:
    a) h = constant, angle-of-attack = constant
    b) V = constant, angle of attack = constant
    c) V = constant, h = constant

47. Determine the altitude (ft) and speed (ft/sec) for each case above:
    a) at the initial point (h = 10,000 ft)
    b) at the final point

48. Find the time to achieve the three ranges above in problem 46, in hours

49. For this aircraft, starting at 10,000 ft altitude, find
    a) the conditions for maximum endurance (C_L, C_D, L/D, and V)
    b) the maximum endurance for this aircraft (in hours)
    c) the flight schedule used for (b)

50. For the case of level flight and constant airspeed, we can not maintain the optimal conditions for maximum endurance (or range for that matter). In class we looked at the endurance for this vehicle and selected the maximum endurance V for the initial altitude given so we were not at maximum endurance conditions at the end of the flight. On the other hand, we also looked at the case where we picked the V for maximum endurance at the end of the flight so that we were not at maximum endurance conditions at the beginning of the flight. Unless there were errors in the calculations (there could have been), the endurance calculated was close to being the same.

a) Repeat these two calculations for the case of maximum range. Pick the max range airspeed for the beginning of the flight and compare the range obtained with that obtained using the airspeed that would give us maximum range conditions at the end of the flight.

b) Investigate if we could get a better range by using an airspeed different from those in part (a), and if so, how could we determine it. Calculate the range using such a speed (if it exists).