Problem Sheet Seven

Due April 4, 2002

Read Chapter 3, All of it
Chapter 7, Section 7.8

Note: All problems are to be done using the three equations, (side force, roll, and yaw moment)
Mach 0.2 @ sea level (Aerodynamic properties do not change for $0 \le M_a \le 0.5$)

M_a	C_L	C_D	C_{L_α}	C_{D_α}	C_{m_α}	C_{L_q}	C_{m_q}	$C_{L_{\delta_e}}$	$C_{m_{\delta_e}}$		$C_{n_{\delta_r}}$
0.2	1.182	0.095	5.0	0.75	-0.8	0.0	-8.0	0.4	-0.81		-.063
	C_{Y_β}	C_{l_β}	C_{n_β}	C_{l_p}	C_{n_p}	C_{l_r}	C_{n_r}	$C_{l_{\delta_a}}$	$C_{n_{\delta_a}}$	$C_{y_{\delta_r}}$	$C_{l_{\delta_r}}$
	-.72	-.103	0.137	-.37	-.14	0.11	-.16	-.054	0.0075	.175	.029

Its physical characteristics are given by:
W = 38,200 lbs h = 0.25 S = 545.5 ft^2 $\bar{c}$ = 10.93 ft b = 53.75 ft
Maximum aileron and rudder deflections are 30 degrees.
The landing gear is 8 ft off the center line and extend 4 ft below the wing which has zero dihedral

26. Assume this aircraft lands at 150 ft/sec.
    a) determine the lift coefficient required
    b) Can this aircraft land in a 60 ft/sec cross wind (from the left).
        i) Determine the controls and bank angle required (sketch a figure showing the control deflections and bank angle as observed from the rear.
        ii) Determine the limiting factor(s) that determines if landing is possible
        iii) If landing is not possible find the maximum cross wind in which a landing is possible.

27. If landing is not possible in problem 26, rather than looking for an airport with a lower crosswind, the pilot figures s/he can land at a higher speed. Determine if this reasoning is correct, and if so, determine the minimum landing speed.

28. Determine the maximum steady state roll rate, in degrees per second, that this aircraft can sustain.

29. Assuming a single engine thrust of 4000 lbs, located 10 ft off the centerline,
    a) determine the minimum engine out control speed for this aircraft (V_{mc}).
    b) Sketch the control deflections and bank angle looking from the rear for the case where the engine out configuration causes a positive yaw moment.

30. This aircraft (with symmetric thrust again) is configured to fly a steady state, 60 degree banked horizontal turn (a 2 g turn). Determine the deflections of the controls required for this (coordinated) 60 degree banked turn.