Unified Engineering Spring Term 2004

Problem P5. (Propulsion) (L.O. D)

For a future high performance military fighter, with a wing loading (W/S) of 3500 N/m2, does it require does it require a higher ratio of thrust to weight to

i) Perform a steady, constant altitude, constant speed 5g combat turn at M=0.9, or

ii) Accelerate from M=0.5 to M=2 in 20 seconds?

(Note, for a 5g turn the load factor, n=5, is the acceleration perpendicular to the wing. For n=1, L=W.) Assume all the maneuvers occur at an altitude of 11km where the pressure is 22.6 kPa, the temperature is 217 K, the density is 0.34 kg/m3, and the speed of sound is 295 m/s.

Assume the coefficient of lift takes the form

$$C_D = kC_L^2 + C_{Do}$$

Where

Flight Mach number