

**AA360 Propulsion
Spring 2008
HOMEWORK #5**

DUE: THURSDAY, MAY 8, 4:00 pm at JH's Office

1. (8 pts.) Compare the fuel/air mass ratios, specific thrusts, and specific fuel consumptions of a turbojet and a ramjet that are both designed for flight at $M = 1.5$ and 50,000 ft. altitude (ambient pressure and temperature: 11.6 kPa and 205 K, respectively). Consider the mass flow of the fuel in your calculations.

The turbojet compressor pressure ratio is 12 and the maximum allowable temperature is 1400 K. For the ramjet the maximum temperature is 2500 K. For simplicity ignore aerodynamic and other losses in both engines. The same conventional hydrocarbon fuel is used in both engines (heating value 45,000 kJ/kg). Take constant gas properties $\gamma = 1.4$ and $c_p = 1.0$ kJ/kg-K.

2. (10 pts.) Problem 6-7 from *Mattingly's* book. The necessary formulae for determination of the polytropic efficiencies are developed in problem 6-3.
3. (10 pts.) Problem 7-3 from *Mattingly*. This problem involves the use of realistic efficiencies for all major turbojet components, and also the inclusion of real gas effects through changes in the gas constants. To evaluate the effect of losses, compare the performance calculated here with that of the engine in Example problem 7.1 (p. 387). Comment on how this change in performance compares to the changes in component efficiencies between the two engines.

Please note that the FIRST EXAM will be FRIDAY, MAY 9, in class.

The exam location will be JOHNSON 075.

Solutions to this homework set will be posted late Thursday afternoon.

(end)