

16.50 Spring 2001

Problem Set #7

Assigned: 3/23/01

Due Date: 4/4/01

You are requested to do a preliminary design for the engines for a supersonic “Biz-Jet”, which is to cruise at $M=2$ at 15 km altitude. The aircraft will have a mass of 50,000 kg at end of climb, a lift/drag of 10 and a fuel mass fraction at end of climb of 0.4. It will have 2 engines. Assume Turbojet engines, with a turbine inlet temperature ratio $\theta_t=6.5$. The engines are to be sized to match the cruise flight condition. The compressor pressure ratio is to be selected for maximum thrust/airflow.

Your results should include estimates for the following:

- a) The Specific Impulse
- b) The compressor inlet flow area for one engine (assume $M_2=0.5$)
- c) The maximum cruise range of the aircraft
- d) The thrust/weight ratio of the aircraft at sea-level-static conditions
- e) The compressor pressure ratios at cruise and at takeoff.