

GP

## Homework 2

AE 5535

Assigned: 2/15/2021

Due: 2/22/2021

An ideal fixed-area turbojet (FAT-jet) is operated on-design where  $\pi_c = 15$ ,  $M_0 = 0.8$ ,  $T_0 = 260\text{K}$ ,  $T_{t4} = 2000\text{K}$ , and  $P_0 = 20,000 \text{ N/m}^2$ . Mass flow rate of air processed by this engine at on-design is 100 kg/sec.

What will be the performance of this engine (thrust and mass capture) compared to the on-design conditions if it is flown at a Mach of 0.3 and at an altitude where temperature and pressure are 288K and 101325 N/m<sup>2</sup>, respectively. Furthermore, the fuel throttle is set such that fuel flow rate is 21.5% higher than the fuel flow rate at the on-design point. Assume that  $A_9$  is varied to keep  $P_9 = P_0$ .

What is the ratio of the off to on-design  $A_9$  required to maintain  $P_9 = P_0$ ? Does this seem reasonable? If not, perhaps the analysis needs to be redone with the  $A_9$  'fixed'. (Don't do it, just realize it).