Chapter 4, Question 2: Aircraft/Engine Performance

Cruise for a new two-engine commercial aircraft will begin at 9km and it should arrive at this altitude with thrust available to climb at 300ft/min (1.5 m/s) while traveling at M=0.85 (250 m/s). Assuming that L/D is 16 and that the initial cruise mass is 300,000kg, find the thrust required from each engine to achieve this rate of climb.

1) 8820 N

2) 10,275 N

3) 17,640 N

4) 100,695 N

5) 201,390 N

6) I don't know

L.O. D

Chapter 4, Question 2 Answer

The correct answer is 4) 100,695 N

If you picked 5) you forgot that the airplane has two engines. If you picked 2) you used mass instead of weight (off by 9.8). If you picked 1) you forgot the DV term. If you picked 3) you forgot the DV term and the factor of 9.8.

$$P_{AVAIL} - P_{REQD} = \frac{d}{dt}[P.E.]$$

$$TV - DV = W\frac{dh}{dt}$$

$$L = W\cos\theta \approx W$$

$$D = \frac{W}{L} \cdot D = \frac{W}{L/D}$$

$$T = \frac{W}{V}\frac{dh}{dt} + D$$

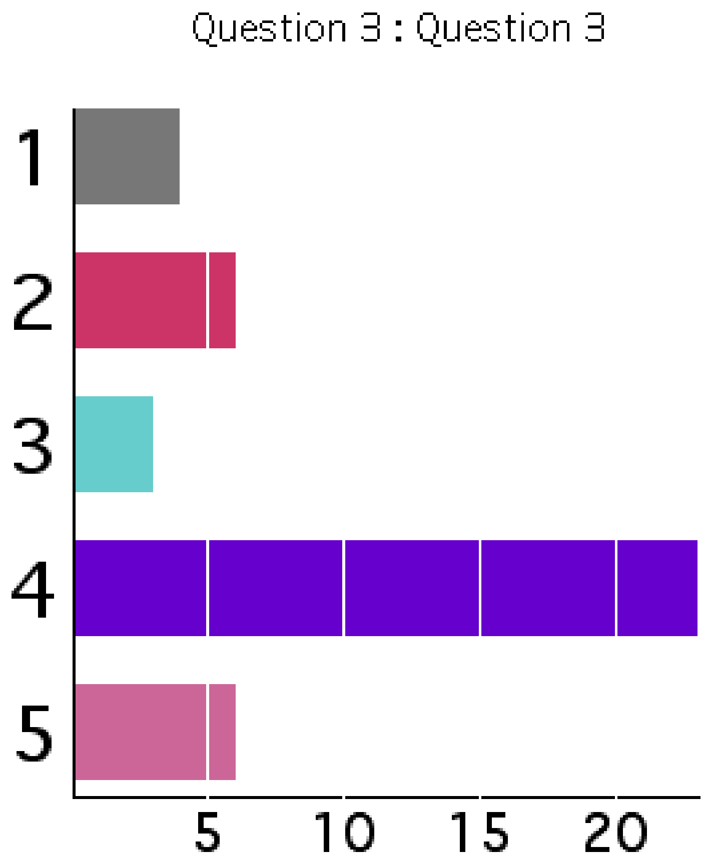
$$T = \frac{W}{V}\frac{dh}{dt} + \frac{W}{L/D} = W\left[\frac{1}{V}\frac{dh}{dt} + \frac{1}{L/D}\right]$$

$$T = 300{,}000(9.8)\left[\frac{1.5}{250} + \frac{1}{16}\right] = \cancel{198450}\ 201390$$

$$T_{per\ engine} = \cancel{99225}\ (2\ \text{engines})$$

$$100695$$

Class performance (2003):



Class performance (2001):

Question 2 : Question 2