Class VIII: Introduction to Aerospace Engineering

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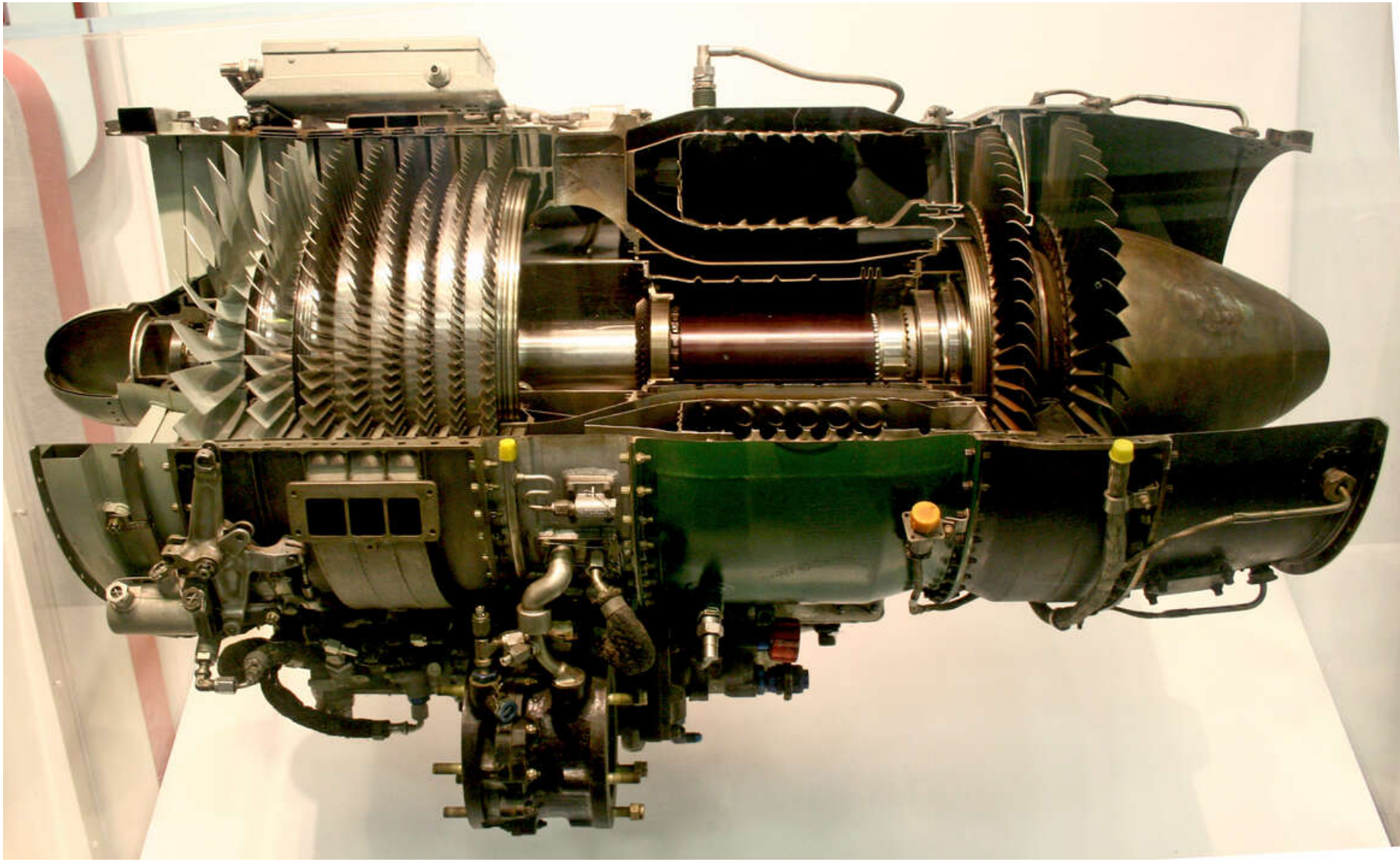

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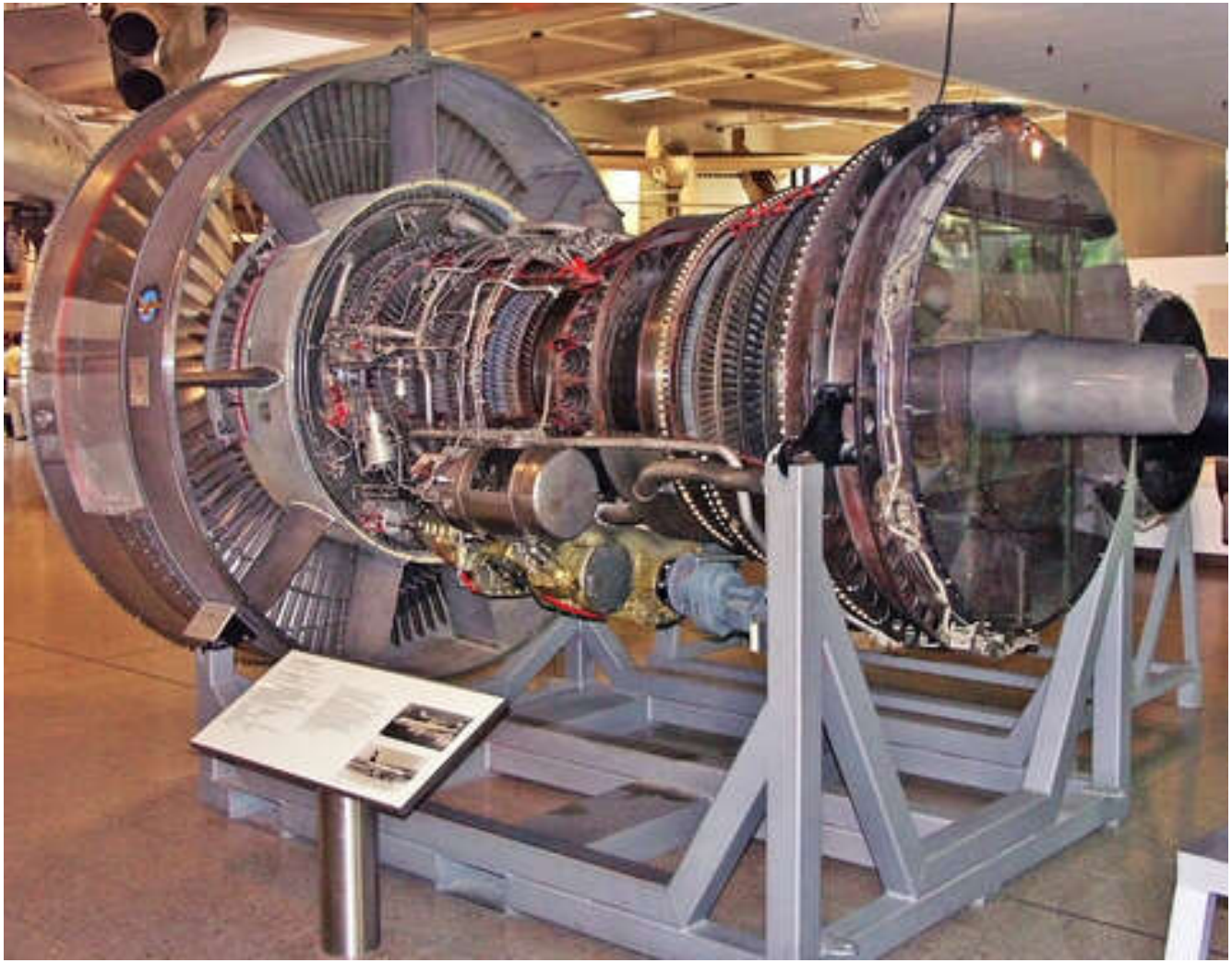

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Why Classification: Weight estimation

$$W = W_p + W_{str} + W_{pp} + W_f + W_{sys} + W_{sp}$$

$$1 = \bar{W}_p + \bar{W}_{str} + \bar{W}_{pp} + \bar{W}_f + \bar{W}_{sys} + \bar{W}_{sp}$$

$$1 - \left(\bar{W}_{str} + \bar{W}_{pp} + \bar{W}_f + \bar{W}_{sys} + \bar{W}_{sp}\right) = \bar{W}_p$$

$$1 = \frac{\bar{W}_p}{1 - \left(\bar{W}_{str} + \bar{W}_{pp} + \bar{W}_f + \bar{W}_{sys} + \bar{W}_{sp}\right)}$$

First Weight Estimate

$$W = \frac{W_p}{1 - \left(\bar{W}_{str} + \bar{W}_{pp} + \bar{W}_f + \bar{W}_{sys} + \bar{W}_{sp}\right)}$$

First Weight Estimate: an example

$$W = \frac{W_p}{1 - (\bar{W}_{str} + \bar{W}_{pp} + \bar{W}_f + \bar{W}_{sys} + \bar{W}_{sp})}$$

primitive need: 100 passengers; Chennai-Mumbai

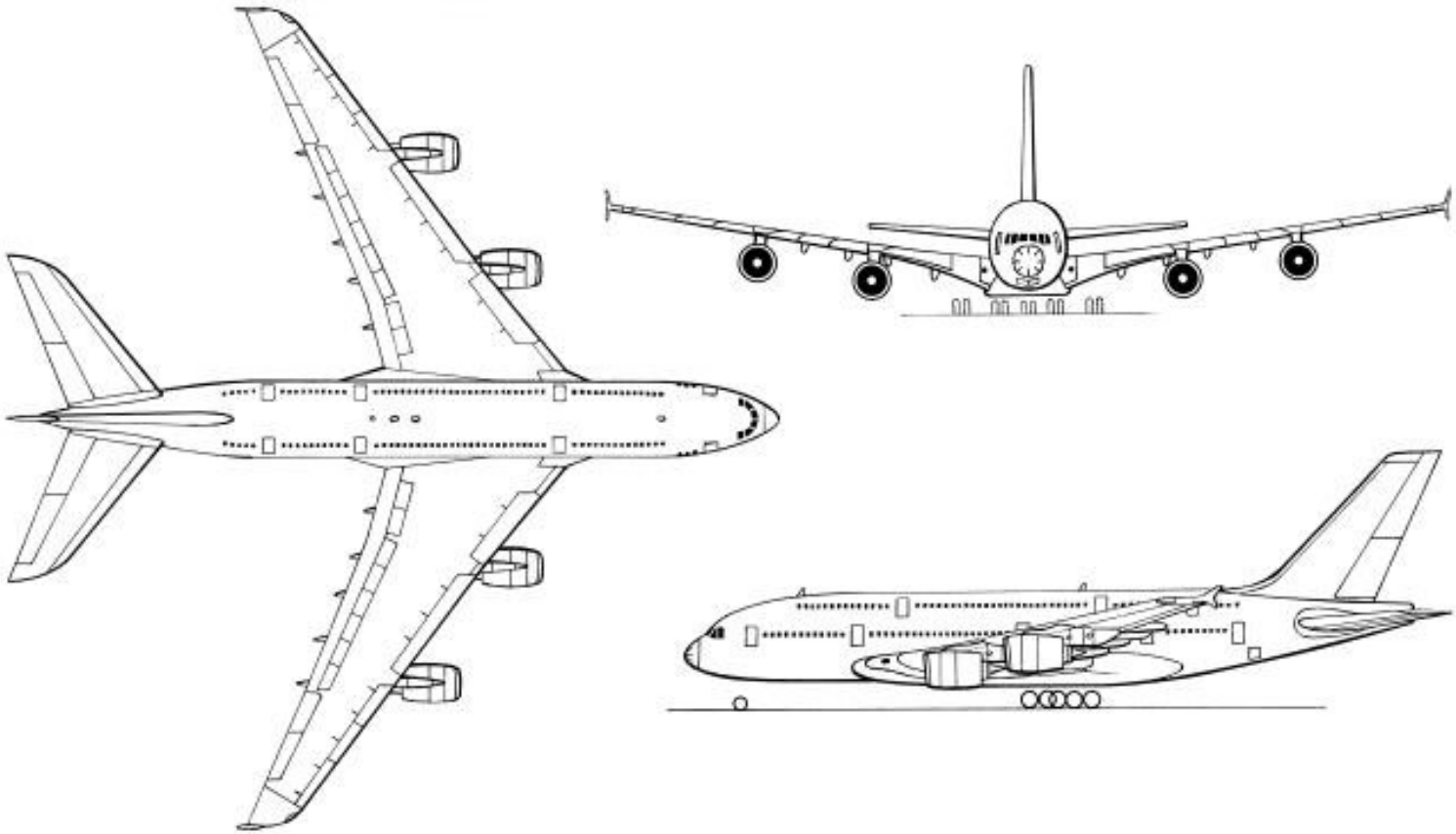
Payload $W_p = 100 \times (100 + 2 + 1 + 2) = 10500kg$

If $(\bar{W}_{str} + \bar{W}_{pp} + \bar{W}_f + \bar{W}_{sys} + \bar{W}_{sp}) = 0.9$

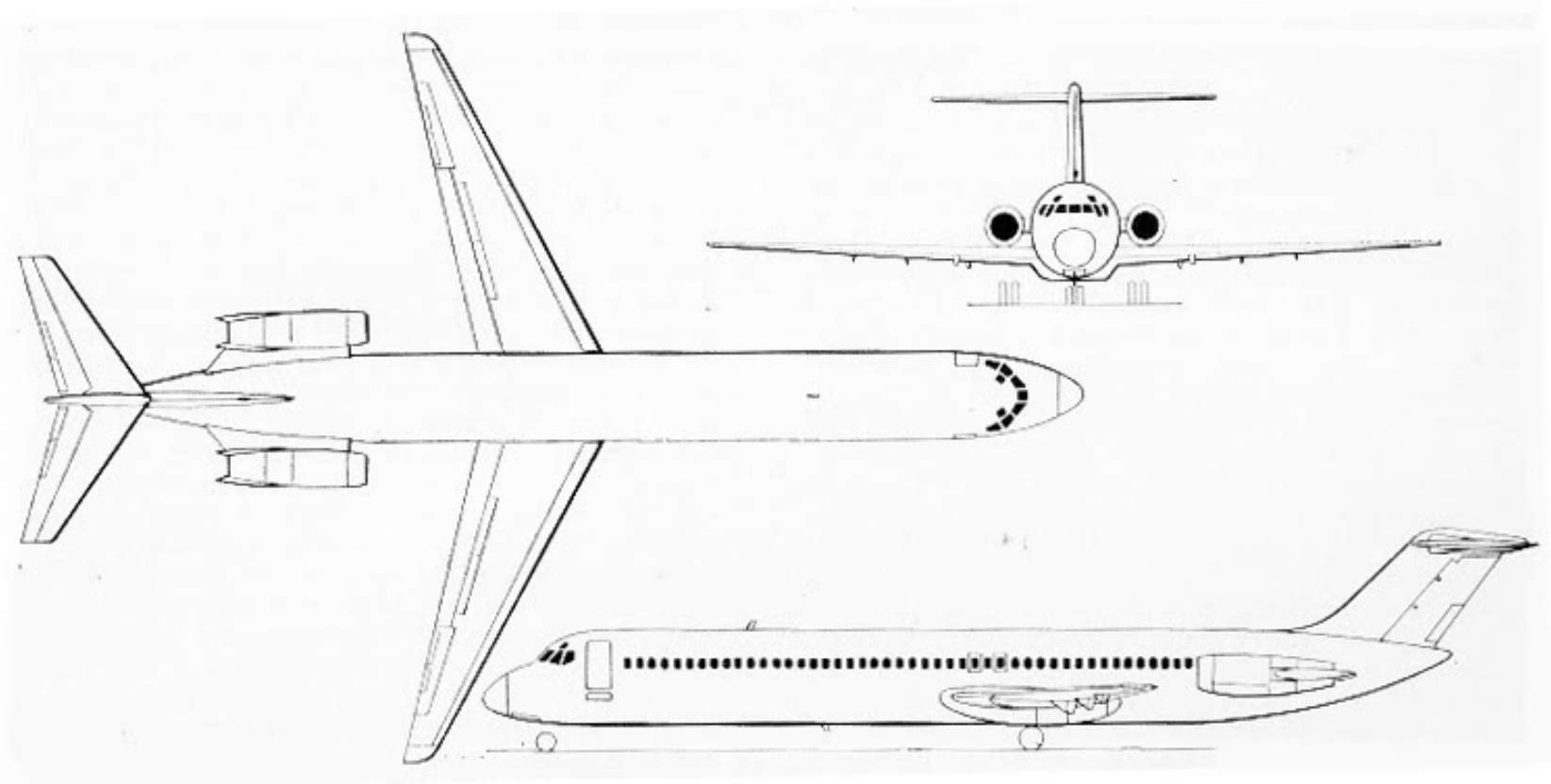
then

$$W = \frac{W_p}{1 - 0.9} = 105,000kg$$

Location of Engine



Location of Engine



Location of Wing