Aircraft Design

Primitive Requirement : 100 ppl

Let's say we need to design a plane for 100 people

As per DGCA Guidelines, we need to have 2 pilots

For 40 ppl in Economy, we need 1 attendent

For 20 ppl in Business Class, we need 1 attendent

For a plane with 80 Economy seats and 20 Business seats : 3 attendants

Therefore, total number of people = 100 + 2 + 3 = 105

Let the weight per person be 100kg: Payload weight (W_p) = 10500kg

Other weight that is carried by an aircraft is:

- Weight of Structure (W_str)
- Weight of powerplant/engine (W_pp)
- Weight of fuel (W_f)
- Weight of systems (W_s)
- Weight of other special payload (W_sp)

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

$1 = \overline{W}_p + \overline{W}_{rest}$

$\overline{W}$ = fraction wrt total weight

By Mathematical manipulation

$$W = W_p * \left[\frac{1}{1 - \overline{W}_{rest}} \right]$$

$\overline{W}_{rest}$ can be found by data from other airplanes of the same type.