MOGA MODELLING

Objective Functions

1) Increased Payload Mass = J1
2) Minimize Cost = J2

Modelling Design

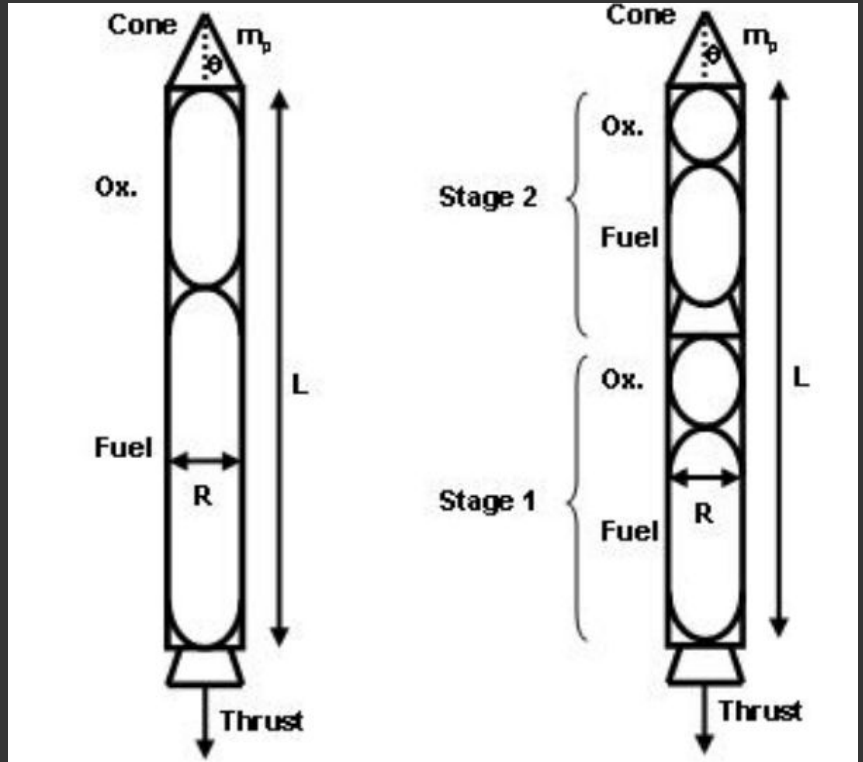

Figure 1. One-stage and two-stage rocket diagrams.

Three More Output Constraints other than Objective fn.

1) Altitude
2) Bending Frequencies
3) Axial Frequencies

(Refer Table 1 of Material Shared)

Note :

1) Thrust Parameters (T1...T5)

→ Spline [L.Interp] (Details)

2) Turning Angles (Alpha1, Alpha2) [Thrust Angle Parameters]

→ Alpha1 : Altitude starting turn

→ Alpha2 :Additional Altitude bending ends (complete turn)

[Condn] :

Angle < alpha1 : Angle =0

Angle > alpha1+alpha2 Angle =90

Intermediate angles : **angle = [1-cos(π*(A-α_1)/ α_2))]*π/4**

Graph Visualisation (refer Material)

alpha 1= 100 km

alpha 2 =200 km

Table 2 : N^2 diagram of design variables

(refer)

Understanding How to Read?

*__Mach No.__ : Relative Measure of Velocity by division of local velocity with velocity at that medium.

TRAJECTORY SUBSYSTEM

⟶ Shooting Method to solve for ODEs (Details)

→ State Vector : [r, longitude, V_r, omega, m]

*Air Density and Temperature reference from 1962 US std. Atmospheric model.

→ [Radial Velocity, Omega, Radial Acceleration, angular acceleration, Changing mass] : Control Variable

MASS ENGINE SCALING

Can be of changing Definition.

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https://studylib.net/doc/10834598/integration--of-system-level--optimization-with--concurrent

MAX - Q

$$rho.u.(du/dx) = -d(P)/dx$$

$$\Rightarrow d(rho.u^2/2) = -d(P)/dx$$

$$\Rightarrow d(rho. u^2/2 + P)/dx = 0$$

⇒ dynamic pressure + static pressure = constant