Theory of 2D-Rockets basically

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1 Assumption

1.2Dimensional motion: Our rockets only consider 2Dimension,x-z flat (The z-axis points upward, and the x-axis is horizontal.)
2.rigid body: The rocket is treated as a rigid body, meaning it does not deform during flight.
3.Translation and rotation: The rocket's motion includes both translation (movement through space) and rotation (spinning around its center of mass).
4.Aerodynamic force only acts as drag.
5.Gravity acts downward along the z-axis with a constant acceleration of $g = 9.81\,\mathrm{m/s^2}$.
6.constant air density of $\rho = 1.225\,\mathrm{kg/m^3}$ (sea level standard conditions).

2 Coordinate system and state variables

2.1 1.Definition of system coordinate

1.Inertial frame of reference: origin at launch point 2.