



VISION

INSPIRING
PASSION FOR
ROCKETRY
AMONG THE
YOUNGSTERS

Mentors

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HISTORY OF ROCKETS

1. Robert H Goddard Model
2. V2 Rockets
3. Apollo 11 Programme
4. Starship



PROPELLANT, ENGINES AND POWER CYCLE

PROPELLANTS

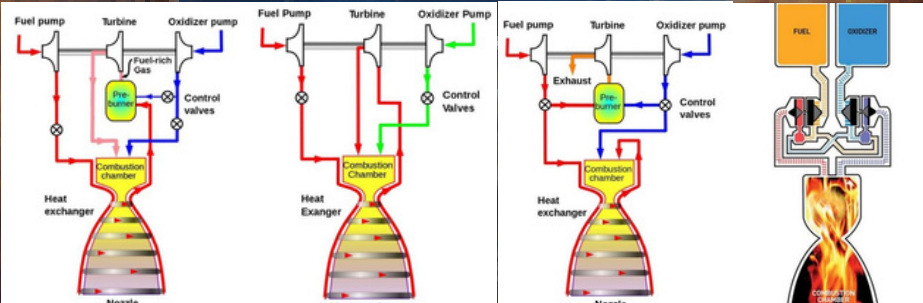
- Liquid
- Solid Monopropellant
- Hypergols

ENGINE PARTS

- Nozzle
- Combustion Chamber
- Injector

COMBUSTION CYCLES

- Gas Generator cycle
- Expander cycle
- Staged combustion
- Full flow staged combustion



ROCKET EQUATIONS

1. $\Delta M/M = 1 - \exp(\Delta v/v_{ex})$
2. $\Delta v = I_{sp} g_0 \ln(M_0/M_f)$

COORDINATE SYSTEMS


1. ALT-AZ System
2. RA-DEC System

TRAJECTORY PLANNING

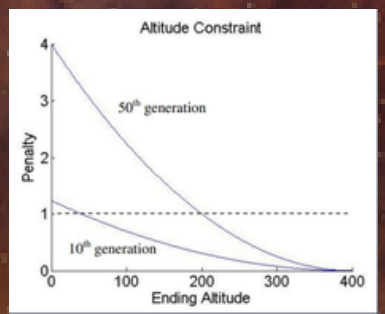
The five parameters-

- Thrust at five different altitude
- Gravity turn altitude of start and end
- Cone Half Angle
- Rocket Radius
- Initial Wet Mas

ROCKET EQUATIONS

$$\begin{aligned} \frac{d}{dt} r &= r' \\ \frac{d}{dt} r' &= -\frac{\mu}{r^2} + r\theta'^2 + \frac{T(r) - D(r, r')}{m} \cos(\alpha(r)) \\ \frac{d}{dt} \theta &= \theta' \\ \frac{d}{dt} \theta' &= \frac{T(r) - D(r, r')}{r \cdot m} \sin(\alpha(r)) \\ \frac{d}{dt} m &= \frac{-T(r)}{I_{sp} \cdot g_0} \end{aligned}$$


MOGA TO SSTO



Penalty function is defined as a function of the max altitude of the rocket and it's generation. The fitness of the model is then dependent on the penalty and the levels of dominance of the model.

ORBITAL DYNAMICS

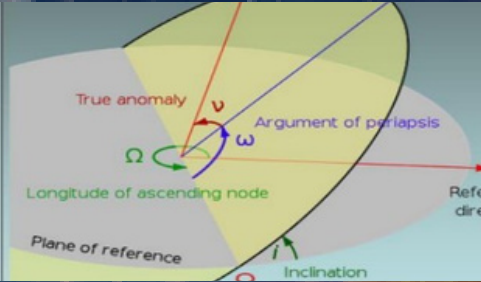
1. Six Keplerian Elements
2. Lagrange points
3. J2 Nodal Regression
4. J2 Apsidal Rotation
5. Hohmann Transfer
6. Graveyard Orbit
7. Gravitational Assist

e = Eccentricity (of the elliptical orbit)

v = True anomaly The angle between perigee and satellite in the orbital plane at a specific time

i = Inclination The angle between the orbital and equatorial planes

Ω = Right Ascension (longitude) of the ascending node The angle from the Vernal Equinox vector to the ascending node on the equatorial plane



BASIC ANATOMY

The main parts of a rocket are -

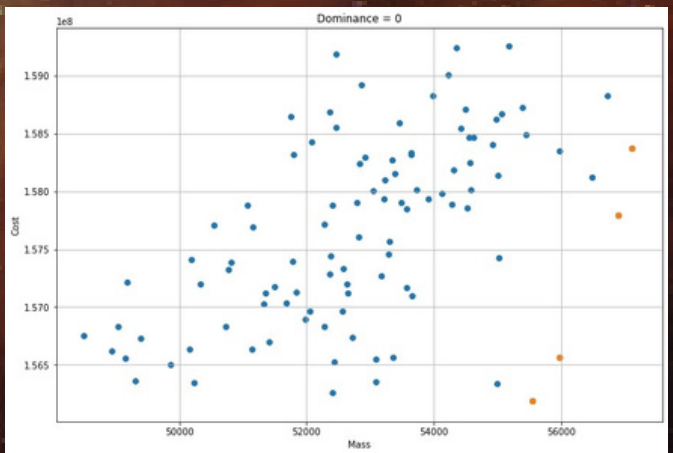
- Nose cone
- Fairing
- Body
- Fins
- Engine

For stability, Cg should always be higher than Cp



GENETIC ALGORITHM & ROCKET OPTIMIZATION

Genetic algorithms are commonly used to generate high-quality solutions to optimization and search problems (with the aid of fitness function & pareto fronts).



MENTEES:

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