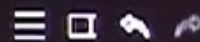


AE441 - Rocket Propulsion

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Four chapters

1) Intro. to rocket propulsion

Various rocket types

✓ Thrust, I_{sp} ...

✓ Single./multi staging.

ii) Principles of combustion ←

- Thermochemistry ✓

- Adiabatic flame temperature ✓

iii) Rocket performance

- Thrust chambers.
- Supersonic nozzles] -

IV) Non-chemical rockets

Electrostatic propulsion.

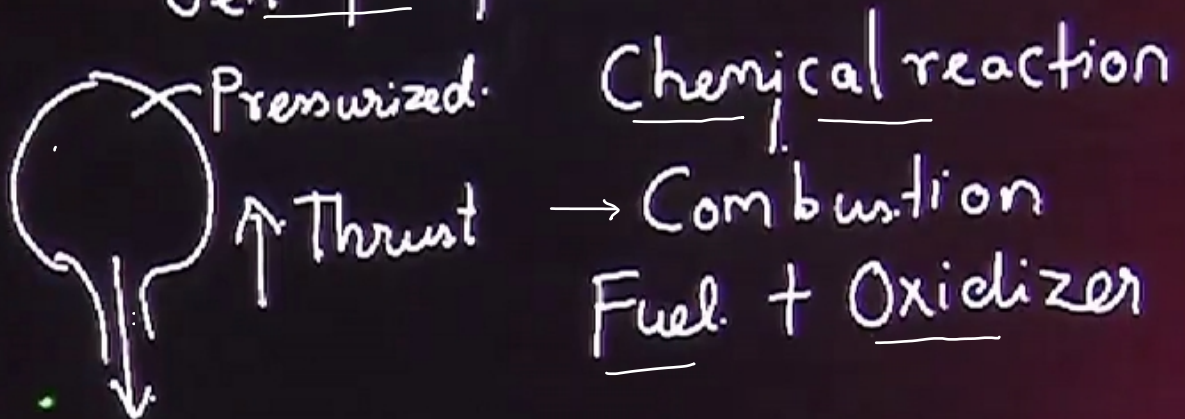
Text book

1. Sutton & Biblarz, Rocket propulsion elements, John-Wiley & sons

2) Hill. & Peterson, Mechanics
& Thermodynamics of propulsion
Addison-Wesley

Chap 1. Introduction to Rocket
Propulsion.

Jet propulsion



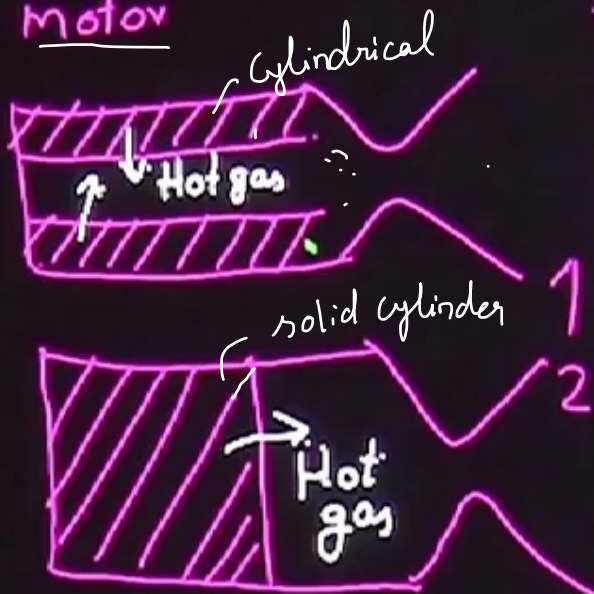
Aircraft — Air-breathing propulsion
Fuel. O_2 - atmosphere

{ Fuel. + Oxidizer.
Non-air-breathing propulsion
→ Rocket propulsion.

Rocket propulsion

Three types. Fuel. + O_2

Solid rocket motor



Adv.

Simple.

Construction

Missile applications

Disadv.

1. Low thrust

2. Non-restartable

Examples

1. First / Strap on Stages of PSLV

Liquid rocket

Engine.

UDMH

fuel.

N_2O_4

O_2

Pump

Moving
Component

Combustion
chamber

Adv.

1. High Thrust.
2. Restartable

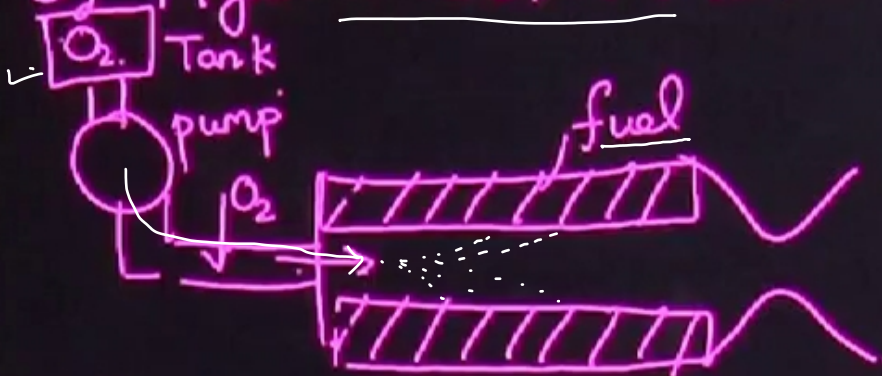
→ Disadv.

1. [Complicated
Construction]

Examples

1 2nd stage of PSLV-Vikas

3) Hybrid rocket motor



Adv.

- 1) Restartable
- 2) Simpler in construction
Than liquid rocket engine

Disadv.

- 1) Large thrust
Variation

Please watch the following youtube videos showing the above three kinds of rockets in operation.

Rocket launch: <https://www.youtube.com/watch?v=k861w4dDJLo>

Solid roket motor (end burning): https://www.youtube.com/watch?v=_xvVJQSGHts
<https://www.youtube.com/watch?v=30KSt4Iy9Q8>

Liquid rocket engine: <https://www.youtube.com/watch?v=qiMSko4HBe8>

Hybrid rocket motor: <https://www.youtube.com/watch?v=TLPWqCMb7DE>