



SNS COLLEGE OF TECHNOLOGY

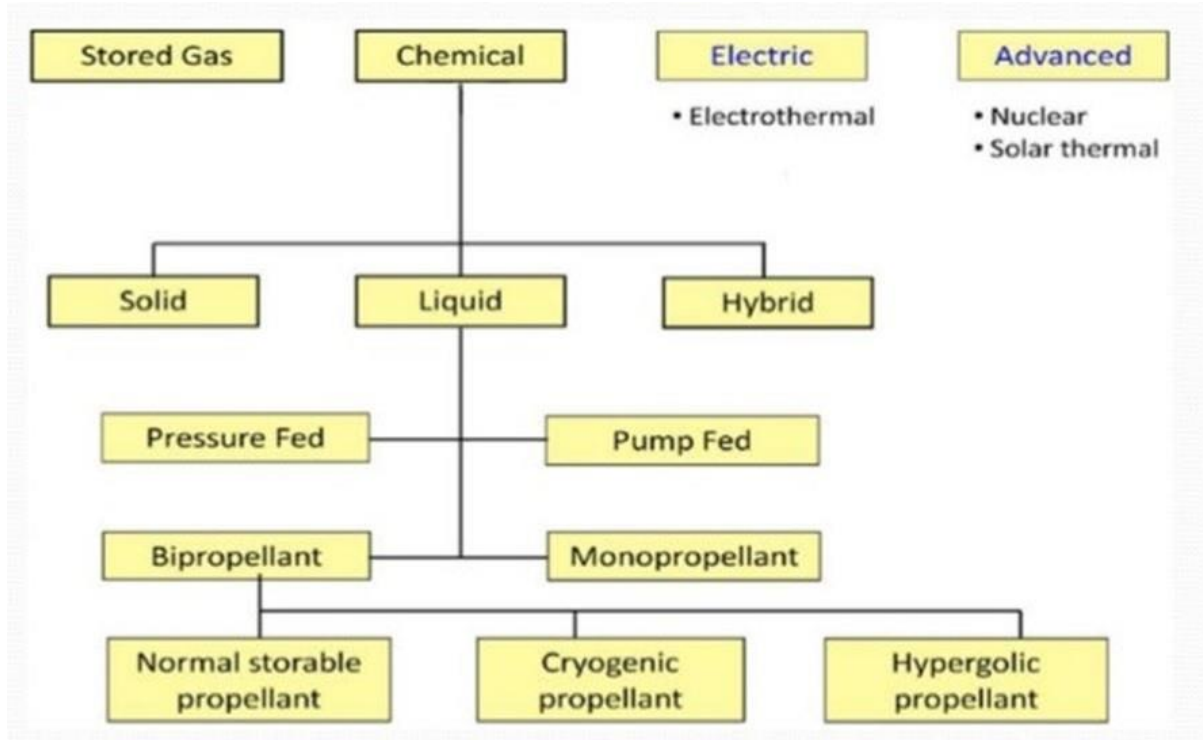
(An Autonomous Institution)

DEPARTMENT OF AEROSPACE ENGINEERING

Subject Code & Name: **23AST101 Fundamentals of Aerospace Engineering**

Topic: Types of rockets

Rockets can be classified based on several criteria such as their purpose, propulsion method, and design. Here are the main types of rockets:



Based on Purpose

1. Space Launch Vehicles:

- **Examples:** Saturn V, Falcon 9, Ariane 5
- **Function:** Used to transport payloads (such as satellites, crewed spacecraft, or cargo) from Earth into space.

2. Missiles:

- **Examples:** Intercontinental Ballistic Missiles (ICBMs), Cruise Missiles
- **Function:** Military rockets used to deliver warheads over long distances.

3. Sounding Rockets:

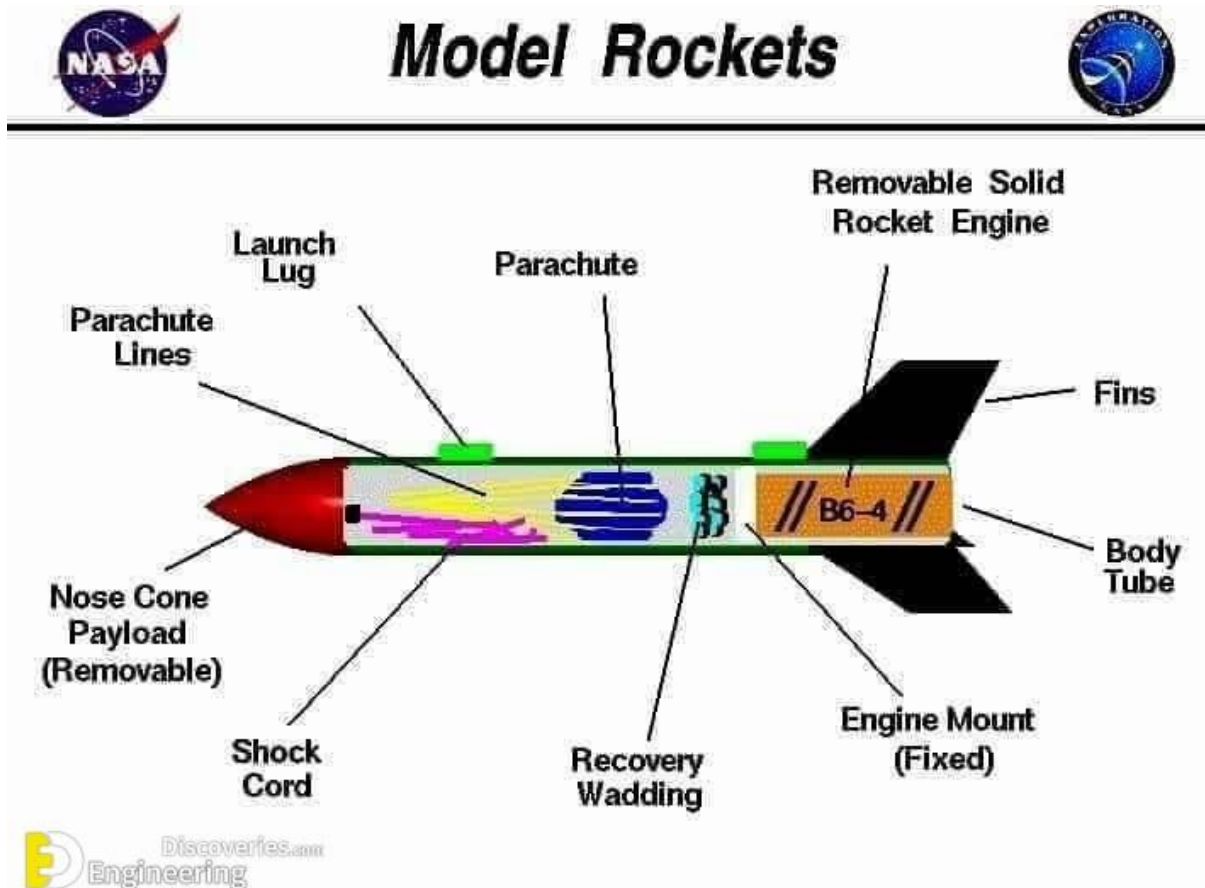
- **Examples:** Black Brant, Terrier-Orion
- **Function:** Used for sub-orbital research missions, including atmospheric and microgravity research.

4. Model Rockets:

- **Examples:** Estes Rockets, Quest Rockets
- **Function:** Small-scale rockets used for educational and recreational purposes.

5. Research Rockets:

- **Examples:** V-2, X-15
- **Function:** Used for experimental and research purposes, often to test new technologies or study high-speed flight.



Based on Propulsion Method

1. Chemical Rockets:

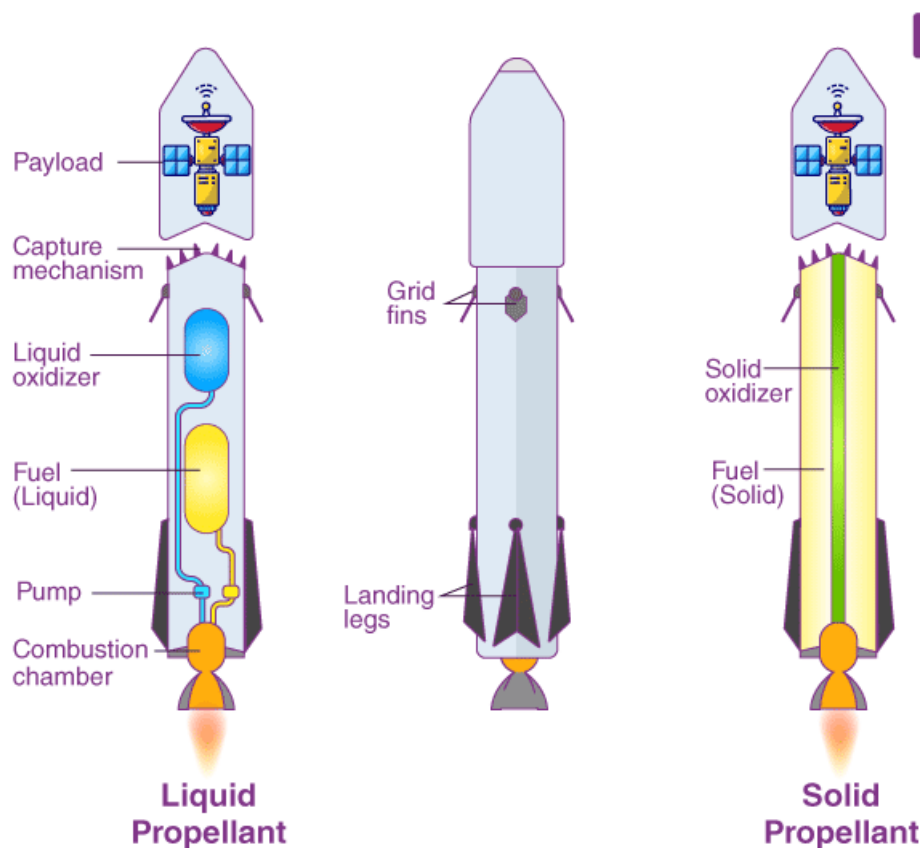
- **Liquid Propellant Rockets:** Use liquid fuels and oxidizers stored separately and mixed in the combustion chamber.
 - **Examples:** Space Shuttle Main Engines, Falcon 9
- **Solid Propellant Rockets:** Use a solid mixture of fuel and oxidizer.
 - **Examples:** Space Shuttle Solid Rocket Boosters, Minuteman III ICBM
- **Hybrid Propellant Rockets:** Use a combination of solid fuel and liquid or gaseous oxidizer.
 - **Examples:** SpaceShipOne

2. Electric Rockets:

- **Ion Thrusters:** Use electric fields to accelerate ions to produce thrust.
 - **Examples:** NASA's Dawn spacecraft
- **Hall Effect Thrusters:** Utilize magnetic fields to produce plasma and generate thrust.
 - **Examples:** SMART-1 (ESA lunar mission)

3. Nuclear Rockets:

- **Nuclear Thermal Rockets:** Use nuclear reactions to heat a propellant, which is then expelled to produce thrust.
 - **Examples:** NERVA (Nuclear Engine for Rocket Vehicle Application)



4. Solar Thermal Rockets:

- **Function:** Use concentrated solar energy to heat a propellant.
- **Examples:** Conceptual designs, no practical examples yet.

5. Photonic Rockets:

- **Function:** Use photons (light particles) for propulsion.
- **Examples:** Conceptual designs like the Breakthrough Starshot initiative.

Based on Design and Staging

1. Single-Stage Rockets:

- **Function:** A single stage to reach its target or orbit.
- **Examples:** Sounding rockets, some small-scale research rockets.

2. Multi-Stage Rockets:

- **Function:** Comprise two or more stages, each of which is jettisoned when its fuel is exhausted to reduce weight and increase efficiency.
- **Examples:** Saturn V, Falcon 9, Delta IV

Based on Launch Platform

1. Ground-Launched Rockets:

- **Examples:** Saturn V, Soyuz, Ariane 5
- **Function:** Launched from fixed or mobile ground-based platforms.

2. Air-Launched Rockets:

- **Examples:** Pegasus rocket
- **Function:** Carried to a high altitude by an aircraft and then launched.

3. Sea-Launched Rockets:

- **Examples:** Sea Launch's Zenit-3SL
- **Function:** Launched from floating platforms or submarines.

4. Space-Launched Rockets:

- **Examples:** Conceptual space tugs or reusable upper stages.
- **Function:** Launched from space stations or other spacecraft.

Summary

Rockets are versatile tools used for a wide range of applications, from launching satellites and crewed missions into space to delivering military payloads and conducting scientific research. Their classification depends on their purpose, propulsion method, design, and launch platform. Each type of rocket has specific characteristics and advantages tailored to its intended use, showcasing the diversity and adaptability of rocket technology in advancing human endeavors.