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# **HIGH POWER ROCKETRY**

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# **What is High Power Rocketry?**

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- Between Model Rocketry and Amateur Rocketry
  - Motors are more powerful
  - Motors use composite propellants
  - Rockets constructed of wood, composites, and aluminum
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## **How High Do They Go?**

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- A 100 TO 250 FEET**
  - C 100 TO 1000 FEET**
  - D 200 TO 1500 FEET**
  - F 500 TO 3500 FEET**
  - G 500 TO 4500 FEET**
  - I 1000 TO 13000 FEET**
  - K 1000 TO 20000 FEET**
  - M 2500 TO 30000 FEET**
  - O 10000 TO 60000 FEET**
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# Rocket Motor Definitions

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- **Total Impulse**
    - the force produced by a rocket motor over its entire burn time, Newton-seconds
  - **Newton**
    - the force required to accelerate one kilogram to one meter per second per second
  - **Average Impulse**
    - the total impulse divided by the burn time
  - **Specific Impulse**
    - total impulse per unit weight of propellant
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# Rocket Motor Total Impulse

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## MODEL ROCKET MOTORS

A 1.26-2.50 NEWTON-sec  
B 2.51-5.00 NEWTON-sec  
C 5.01-10.00 NEWTON-sec  
D 10.01-20.00 NEWTON-sec  
E 20.01-40.00 NEWTON-sec  
F 40.01-80.00 NEWTON-sec  
G 80.01-160.0 NEWTON-sec

## HIGH POWER MOTORS

H 161-320 NEWTON-sec  
I 321-640 NEWTON-sec  
J 641-1280 NEWTON-sec  
K 1281-5120 NEWTON-sec  
L 5121-10240 NEWTON-sec  
M 10241-20480 NEWTON-sec  
N 20481-40960 NEWTON-sec

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# Rocket Motor Types

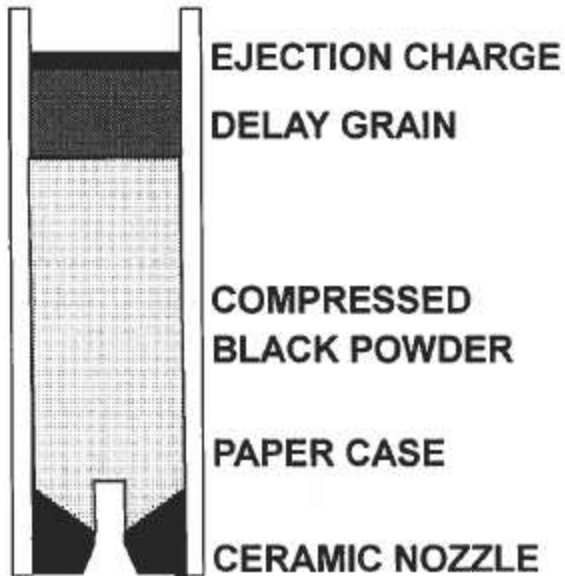
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- **Black Powder Rocket motors**
    - potassium nitrate, sulfur and charcoal
    - specific impulse of 60 seconds
  - **Composite Rocket Motors**
    - hydroxyl terminated polybutadiene (HTPB) and ammonium perchlorate (AP)
    - specific impulse of 160 to 220 seconds
  - **Hybrid Rocket Motors**
    - ABS plastic or cardboard and nitrous oxide
    - specific impulse of 160 to 200 seconds
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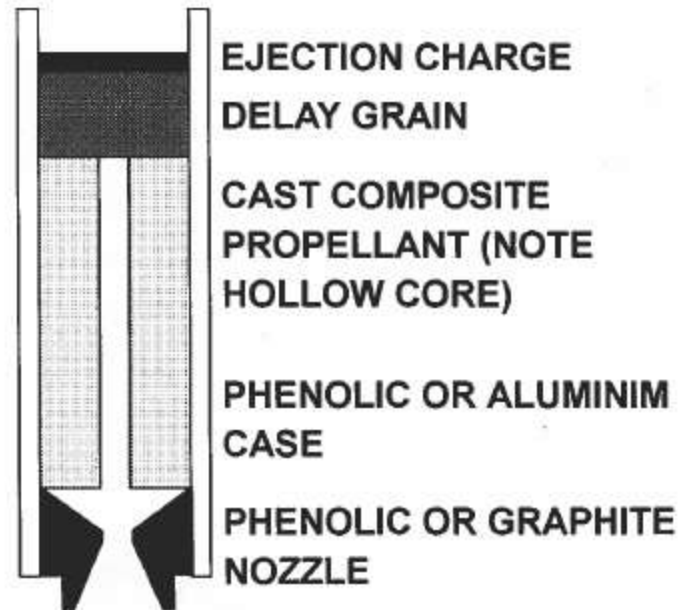
# Rocket Motor Configurations

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**TYPICAL BLACK  
POWDER MOTOR**

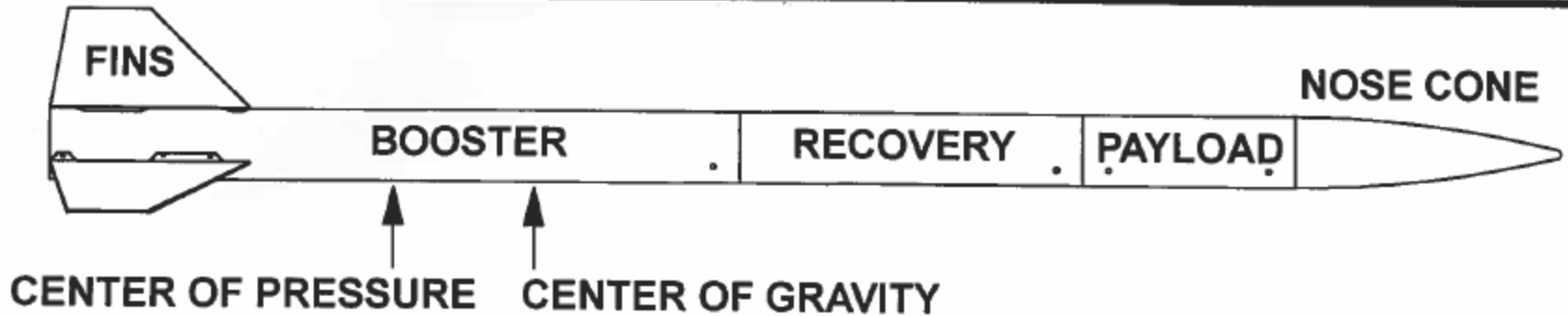


**TYPICAL COMPOSITE  
PROPELLANT MOTOR**



# Rocket Design Considerations

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- A rocket's center of pressure ( $C_p$ ) must ALWAYS be behind the center of gravity ( $C_g$ )