A LIFT SEPARATION SABOT FOR KINETIC ENERGY PROJECTILES

IITM Technology Available for Licensing

PROBLEM STATEMENT

- With the **advancement in ammunition** and **armor technology**, a need exists for **increase in velocity** of the ammunition to defeat the state-of-the-art armor systems.
- Increase in velocity of the projectile can be **achieved** either by **increasing the propellant mass** or by **reducing the parasitic sabot mass**.
- However, **increase in pressure** in the gun system is a direct consequence of adding more propellant mass which in turn **demands development of expensive high pressure** gun systems.
- Also, the conventional kinetic energy rounds have almost reached a saturation velocity, a **need therefore exists for an improved design** to create a breakthrough in the state-of-the-art.
- An **ideal configuration for a sabot** can be with **less weight sabot** that is configured separately from the projectile **without disturbing the trajectory of the projectile.**

TECHNOLOGY CATEGORY / MARKET

Category: Sabot projectile assembly **in Defense Technologies**
Industry: Defense and Aerospace Industry.
Application: Armored/Launching Vehicles.
Market: The global market size of Defense and Aerospace industry was worth around **USD 750 billion in 2022** and is predicted to grow to around **USD 1388 billion by 2030** with a compound annual growth rate **(CAGR)** of roughly **8.2%** between 2023 and 2030.

INTELLECTUAL PROPERTY

IITM IDF Ref. 1965; Patent No: IN 522091;

TRL (Technology Readiness Level)

TRL-3, Experimental Proof of concept.;

Research Lab

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TECHNOLOGY

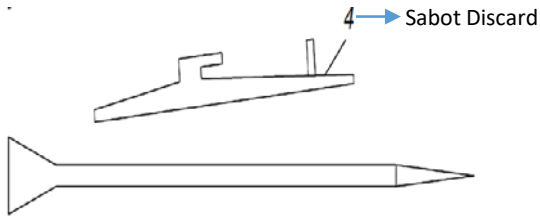
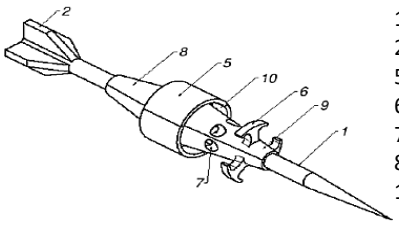


Figure 1 shows a **Sabot discharge**

- A **lift separation sabot** for kinetic energy projectiles, comprising
  - A sabot using additional lifting surface (lift separation) **close to the center of gravity** to reduce the rotation of the sabot ensuring less mechanical contact between the projectile and the sabot.
  - Thereby **improving the accuracy of the ammunition** wherein the **pressurization of the cavity under the center band** using high speed free stream flow **achieves lift separation** in the kinetic energy projectiles.



1-Projectile
2- Fin
5-Central bore rider
6-Front bore rider
7-Annular grooves
8-Rear ramp
10-Outer circumference

Figure 2 illustrates **the main locations of aerodynamic forces acting on the sabot**

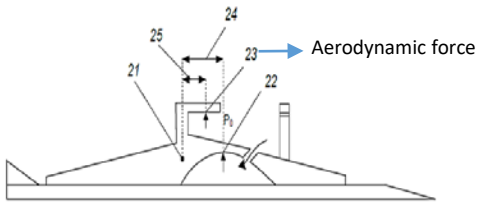


Figure 3 illustrates **the moment arms.**

- From the figure 3 the distance (24) between center of gravity (21) and center of pressure(22) inside the annular cavity is very less compared to a conventional sabot.

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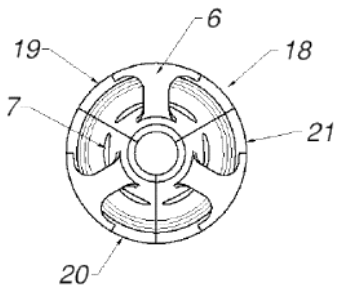
Aerodynamic force **acts on the outer circumference** which leads **to less moment arm** wherein the pressure acts on the **aerodynamic surfaces is equal to a stagnation pressure** behind a normal shock due to the hypersonic speed of the assembly.

- The sabot projectile assembly consists of **three 120-degree sector** sabots and a **projectile and fin**.



6- Front bore rider
7-Annular grooves
18-Assembly
19,20,21-Sabots

Figure 4 shows a **Sabot projectile assembly**

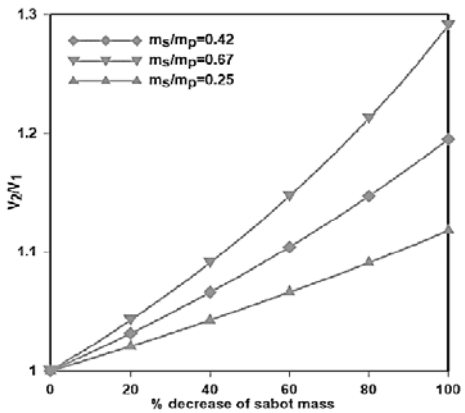


Figure 5 illustrates a graph explaining the **muzzle velocity increment** due to **reduction in sabot mass**

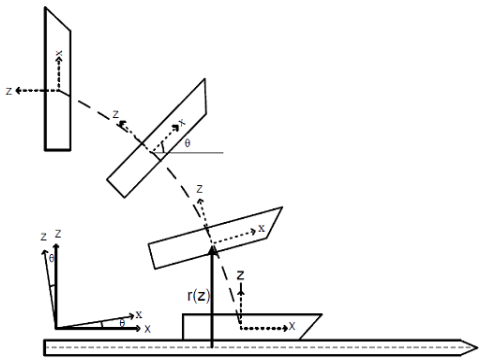


Figure 6 illustrates a schematic view of **radial and angular trajectories** of **sabot with respect to projectile.**

Key Features / Value Proposition

- The **Ministry of Defence** had replied that for the present invention that the patent specifications is **not considered prejudicial** under **Sec 35/36/39 of Indian Patents Act, 1970** to the Defence of India in order to make the product commercially viable.
- The **resulting moment arm** between center of pressure and center of gravity is **less.**
- The **distance** between center of gravity and center of pressure **inside the annular cavity** is **very less** compared to a conventional sabot.
- The front bore rider utilize the advantage of a **T-section**.
- Containing **Minimal discard interference** from sabot **to the projectiles**.
- **Ultra Light Weight** Sabot.
- **High accuracy Ammunition.**
- **High Performance** of muzzle velocity & discard without increasing the chamber pressure of the gun system

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