ELECTROMAGNETIC RAIL GUN

LORENTZ MAGNETIC LOOP GUN. FLUX EDGE GUN. THIS DEVICE IS DANGEROUS AND WE AT UUE RECOMMEND THAT YOU DO NOT BUILD IT.

THEORY:

A railgun consists of two paralle rails which form an acceleration path. A plasma armature provides a closed electrical path between the two rails. When current is applied to the rails, a lorentz force is created by the interaction of the armature current with the mag field of the rail current. This force accelerates the armature from the railgun breech towards the muzzle. The lorentz force is proportional to the current squared. Hence, high currents are used to achieve high accelerations, resulting in high plasma temps. Consequently, the plasma armature ablates and accumulates material from the pellet or projectile and gun barrel. This increases inertial and viscous drag, lowering acceleration.

CONSTRUCTION THEORY:

The rails should be as close to parallel as possible, and the projectile needs to be an electrically conductive object which spans the two rails, making a solid electrical contact with each. The force applied to the projectile depends on three things, the strength of the mag field, the current through the rails and projectile, and the width between the rails.

Thus the force=iLxB.

Force is the force that will acting on the bullet
i is the current at time 0plus or instant
B is the magnetic field the current through the rods and bullet will produce
L is the length between the rods

One needs to find a projectile that will not erode the rails too much, we recommend graphite discs.

When the gun is fired, energy from the cap bank is discharged, and the current will flow from one rail, through the projectile, to the other. This generates a directional magnetic field, called lorentz force, that propels the projectile.

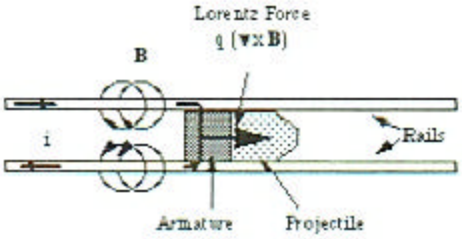
To find the velocity of the bullet use this formula:

$$V = \frac{L' \times i^2 \times t}{2 \times m}$$

L' is the inductance of the rods
i is the current, t is the duration of the current pulse
m is the mass of the bullet or disc

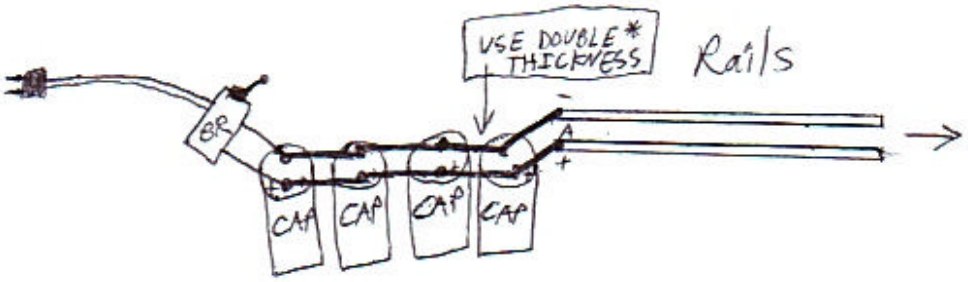
A SIMPLE RAIL GUN CAN BE CONSTRUCTED OF TWO COPPER RAILS THAT ARE ¼" WIDE AND 5.5" LONG. THE BULLET WILL BE A GRAPHITE DISK THAT IS ¾" BY 3/64". USE PHOTOFLASH CAPACITORS IN PARALLEL TO OBTAIN A HIGH CURRENT CHARGE. USE AN INDUSTRIAL POWER SWITCH OR MERCURY SWITCH TO ACT AS THE SWITCH TO INDUCE CURRENT FLOW INTO THE RAILS.

UUE BUILT A RAIL GUN THAT CONSISTED OF TWO STEEL RAILS THAT MEASURED ¼" THICK BY ¾" WIDE BY 8" LONG. OUR RAILS WERE LAID FLAT ON A SPECIAL FIBERGLASS BLOCK AND MILLED INTO PLACE AND BOLTED TO THE FIBERGLASS FRAME. THE INSIDE PARALLEL EDGES WERE FURTHER MILLED TO AN ALMOST PERFECT PARALLEL EDGES. THE PROJECTILE USED WERE STAINLESS STEEL RINGS THAT MEASURED .6" DIAMETER BY 1/16" THICK. THE CAPACITOR BANK CONSISTED OF 4 LARGE, HIGH DISCHARGE RATED CAPS AT 100V EACH @ 200,000MFD EACH. THAT'S 100V@ 0.8F. THAT'S A LOT OF POWER. WE USED A BRIDGE RECTIFIER WITH A CURRENT LIMITING RESISTOR IN SERIES WITH THE BRIDGE. THE OUTPUT OF THE BRIDGE WAS CONNECTED TO THE CAP BANK. IT TOOK A COUPLE MINUTES TO CHARGE THE SYSTEM. THE RESISTOR WAS 500 OHMS AT 40 WATTS. WE DID NOT USE A SWITCH IN OUR DESIGN, WE WIDENED THE PROJECTILE ENTRY POINT ON THE RAILS AND PUSHED THE PROJECTILE INTO THE RAIL GAP. IT STOPS SWITCHING LOOSES.



THIS IS A BASIC DIAGRAM OF COMPONENTS FOR THE RAIL ITSELF.

DIAGRAMS



BR = Bridge Rectifier Circuit with Switch.
* = Double the thickness of the rails.
A = Entry point for the projectile.
Taper it out & fling the projectile into the rails.