

Research Article

Electromagnetic Thruster to Drive Vehicles

Leelananda Jayasuriya*

B.Sc. (Engineering), Design Department, LJ Industries, Kurunegala, Sri Lanka

Abstract

The electromagnetic thruster introduced in this article is a method of propulsion capable of land, on water, under water, sky, and outer space. The new system provides a better propulsion system that has hitherto not been possible. This is a method and device to generate thrust without spending propellant for propulsion, which has particular utility in the propulsion of space vehicles. It is powered by electricity. This Electromagnetic propulsion system constitutes, at least, an identical pair of reciprocating linear motors performing a back-and-forth cycle, each mounted on a rotary motor running on half-circle steps. The linear motors are mounted and secured at mid portions of their stator arms on said rotary motor armatures, lateral to axes of rotation of the associated rotary motor armature. The modules of linear motor and stepper motors are placed apart and secured to the vehicle in a mirror position to each other. When power is supplied, two linear motor armatures move in a cycle along associated stator arms and rotate with accompanying rotary motor armatures in opposite directions to each other in unison during each rotation of rotary motors, performing a cycle of back-and-forth action, propelling in the forward direction. Thus, the reciprocating linear motor pairs carrying rotary motors driven in opposed directions operate in identical specifications. The electrical power supply and connections to the controls of linear motors are carried over the housing of the rotary motor and connected to the terminals of the supply source.

Keywords

Electromagnetic Thruster, Magnetic Levitation, Flow Recycling, Linear Motors, Stepper Motors, Vehicle Propulsion

1. Introduction

This electromagnetic thruster [1] generates force to propel a vehicle carrying cargo and passengers on roads [3, 4], rails, in the sky, on water, underwater, and in outer space. This article describes a new propulsion technique using electrical power with the capability of repeated cycles or "flow recycling." It emphasizes the application of Linear motors on propulsion over traditional propulsion systems that rely on gas expansion and combustion.

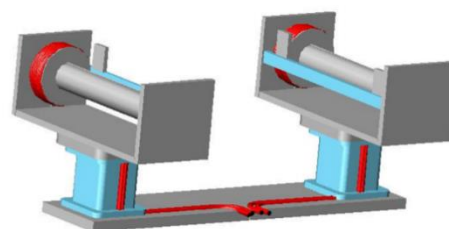


Figure 1. General layout of EMT.

*Corresponding author: leel6391@yahoo.com (Leelananda Jayasuriya)

Received: 16 February 2025; **Accepted:** 27 April 2025; **Published:** 2 September 2025



Copyright: © The Author(s), 2025. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

2. The Description

The ideal requirement of a vehicle should be the ability to move about anywhere without the support of the medium through which it travels. Rocket propulsion is such a solution, but it ejects a massive quantity of propellant that it carries with it. Probably, this exhaust can be hazardous to the environment.

The majority of propulsion systems in use today rely either on exerting forces against the surface over which they travel, otherwise ejecting propellant in the opposite direction to the direction it travels, in the form of exhaust of fuel carried by the vehicle.

The most common energy source on the ground is to carry chemical fuel aboard and make it react with the oxidizer in the environment. In automobiles, the wheels powered by the engines are pushing against the road or ground, while some other vehicles are on rails through friction. The internal combustion piston engines propel automobiles, ships, locomotives, and some aircraft.

The jet propulsion system employs nozzles to accelerate the fluid streams and push the vehicle in the opposite direction it has to propagate, providing reactive force. The jet propulsion systems can be classified as air-breathing jet propulsion systems, non-air-breathing jet propulsion systems, or rocket propulsion systems.

The energy needed for propulsion may come from an external source, such as fossil fuel, from the environment like solar radiation, from an external link, like powered rails, or from storage of onboard batteries.

Yet another propulsion system uses electromagnetic force to move vehicles on rails.

In summary, propulsion requires a force to cause motion with a second system being pushed backwards. Without a second system to be pushed backward, propulsion is not possible despite how much energy is available; and, without energy expenditure, propulsion is not possible either.

Propulsion is the generation of force by any combination of pushing or pulling to modify the translational motion of an object. The use of electrical power can improve the propulsive performance of the vehicle compared with conventional chemical thrusters. When compared with chemical propulsion, electric propulsion is not limited in energy, but limited by the available electrical power on-board.

Current applications of magnetic force in transport can be seen in maglev trains, elevators, and military railguns. For outer space navigation, there are methods still under research and experiments. It includes an Ion thruster for low-orbiting satellites and a magneto-hydrodynamic drive for ships and submarines.

Problems associated with current systems:

The Problem propulsion systems introduced so far are associated with some issues shown below:

- 1) Volatile fuel is required to be carried by the vehicle, which is dangerous to passengers and its contents.

- 2) The systems known so far suffer from the high cost of production of the machine parts and propellants.
- 3) The range and maneuverability of vehicles using thrusters are limited by the amount of fuel carried. For generating propulsion, most methods require the expenditure of mass as exhaust.
- 4) Propellers are directly exposed to the medium the vehicle passes through. So, propulsion pieces of machinery are liable to damage from the medium.
- 5) Thrusters like Ion thrust engines are generally practical in vacuum space and they cannot overcome air resistance as well as they cannot generate sufficient thrust to liftoff from the ground. Therefore, space exploration space crafts have to rely on other methods to move from the ground.
- 6) Particularly, the known systems require a considerably large installation space.

For these reasons and others, a method capable of generating substantial thrust in an inexpensive way with a flexible layout is still prevailing.

The new system provides a better propulsion system that has hitherto not been possible. Introducing a method and device to generate thrust without spending propellant for propulsion has particular utility in the propulsion of space vehicles.

The new device is an electromagnetic propulsion system capable of producing thrust to propel and control a vehicle in the desired direction. The said propulsion system applies to all vehicles moving on the ground, on rails, in water, in the sky, and in outer space.

This Electromagnetic propulsion system consists of at least an identical pair of reciprocating linear motors performing a back-and-forth cycle, each mounted on a rotary motor running on half-circle steps. Each linear motor with a rotary motor is termed as a module in the preceding description. The linear motors of said two modules are mounted and secured at mid portions of their stator arms on said rotary motor armatures, lateral to axes of rotation of the associated rotary motor armature.

The two modules are placed apart and secured to the vehicle in a mirror position to each other. When power is supplied, two linear motor armatures move in a cycle along associated stator arms and rotate with accompanying rotary motor armatures in opposite directions to each other in unison during each rotation of rotary motors, performing a cycle of back-and-forth action. Thus, the said two modules with the reciprocating linear motor pairs carrying rotary motors driven in opposed directions operate in identical specifications.

The electrical power supply and connections to the controls of the linear motors are carried over the housing of the rotary motor and connected to the terminals of the supply source.

The process of operation consists of four steps as follows, which can commence before the next step, which includes:

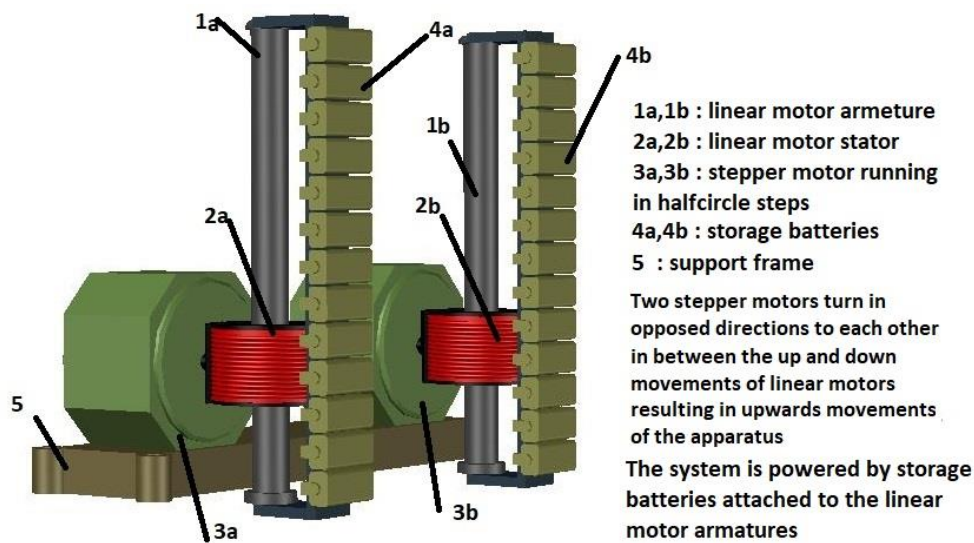
- 1) Setting the two linear motor arms in parallel along the intended propagation direction for the vehicle, and supplying programmed electrical power to draw the pair of LM armatures from the initial position to the opposite end along their stator arms;
- 2) The associated rotary motors turn by 180 degrees to bring each linear motor armature to its previous location;
- 3) Altering the direction of power supply to linear motors, the two linear motor armatures drive again along two LM stators from the present location to the opposite end;
- 4) The rotary motors turn again by another 180 degrees to

complete the cycle of rotation, and continue the sequence, thereafter.

However, each step can start before completing the previous step if desired.

Therefore, during each movement of two linear motor armatures, thrust is produced on accompanied LM stators, driving twice in the opposite direction during the cycle of rotation of the rotary motor armatures, thereby causing thrust along the desired direction on the body of the vehicle.

During the rotation of linear motor armatures, the radial thrust at instantaneous centers of rotation will be neutralized by having the two identical motors rotating in a mirror image configuration to each other.



Electro-magnetic thruster with power source

Figure 2. EMT with Power source.

Electrical power is supplied to energize the system from an electricity generator, batteries, fuel cells, solar power, or any other source capable of producing electricity.

When the vehicle has to change the direction of propagation, means are provided to tilt or turn said two modules individually or together along the intended direction.

Advantageously, to increase thrust, the power supply may increase, a plurality of thrusters may be added, as well as other types of thrusters and navigation systems may accompany the vehicle, depending on the conditions and requirements.

Encoders and other sensing devices may be employed to provide feedback signals that can be used to determine position, count, speed, or direction.

The rotary motors may be servo motors or stepper motors as well.

Accordingly, the following areas are those in which the invention is possible in application:

- 1) Elevators for passengers, goods, and car lifts;

- 2) Vehicles traveling on rails as well as on inclined conveyors;

- 3) Automobiles traveling on roads and off roads, [3, 4] including cars, motorcycles, and vehicles for public transport [4] and vehicles transporting goods;

- 4) Vehicles moving in waters, including boats, ships, and submarines; [5].

- 5) Air vehicles, including helicopters and airplanes; [7].

- 6) Vehicles used to explore and travel in outer space, including launch vehicles, satellites, and rovers. [6].

- 7) It can be used as a wearable device for pleasure walking, riding, and gliding. [2].

In particular, some advantages of the Electromagnetic thruster are as follows:

- 1) Propellers can arrange not to be exposed to the environment or medium the vehicle has to pass through, so that propellers or other machine parts may don't get damaged by the contents and conditions of the medium.
- 2) Using the new thruster, the vehicle is operated by elec-

trical power, generated by any power-generating source, chosen from a wide range and also could be altered.

- 3) Strokes are generated by the linear armatures and they can produce high power.
- 4) The technology uses common materials that are commercially available, reducing cost, risk, and lead time.
- 5) The new thruster is applicable without the expenditure of propellants.
- 6) The present device is applicable in spacecraft propulsion [6] and is capable of generating thrust without propellant. Also, it needs a very small space to accommodate, and it can be propelled using solar power and stored power sources.
- 7) Since this thruster can impose pressure without the aid of an interacting surface, the new invention can be used in civil engineering activities such as digging tunnels, excavating trenches, drilling holes, excavating and moving earth on the ground.
- 8) This thruster is capable of being used as a wearable device [2] for leisure walking and riding, as well, depending on the scale of the device.

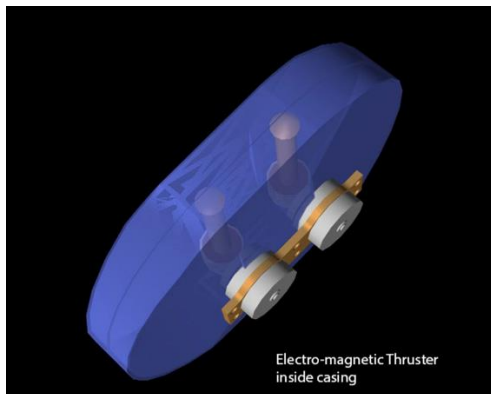


Figure 3. *Electromagnetic Thruster inside cover.*

The future of transportation and machinery operations will rely on electromagnetic thrusters. Electromagnetic Propulsion (EMP) has immense potential due to its ability to power vehicles across various terrains and even in outer space [6]. With its unmatched power delivery system, EMP promises more efficient and reliable performance.

Imagine the simplicity, versatility, cost-effectiveness, and reliability that this technology could bring to future vehicles. Electromagnetic thrusters could usher in a new era of transportation characterized by efficiency and dependability. The exciting potential of this technology offers the opportunity to transform the way we travel for generations to come.

Electromagnetic thrusters are mobile power sources capable of powering vehicles on land, sea, air, and even in space.

At present, road vehicles and trains are driven by a pulling force exerted on their wheels. Vehicles in water, such as ships, boats, and submarines [5], are powered by propellers

attached to drive shafts. Aircraft, like helicopters, use propellers to move through the air, while jet planes are powered by jet engines that expel propellants. Spacecraft rely on ejecting propellants to create reactive pressure for movement in outer space.

Thus, all vehicle propulsion relies on some form of force exerted on the vehicle.

Electromagnetic propulsion, however, generates forward motion by utilizing a magnetic rod within a magnetic field and reversing the current flow to create a repeated reaction force on the vehicle body. This innovative approach produces a unidirectional force to propel the vehicle in the desired direction. The reactive force acting on the magnetic rod upon the vehicle body impels the necessary drive force to move forward, like rocket engines produce thrust by expelling propellants to drive forward.

In contrast, a linear motor operates by using electromagnetic forces to drive a solid armature along a track, rather than relying on expanding gases. This interaction between the stator and armature produces reactive forces on the stator walls, but unlike gas-based propulsion, these forces arise from direct electromagnetic attraction and repulsion rather than pressure-driven expansion. Because these forces are acting on solid materials rather than compressible gases, linear motors can achieve high acceleration and efficient force transmission without relying on fluid dynamics.

While both systems generate force and deliver propulsive power, the fundamental difference lies like the force generation—gas-based engines rely on expansion and momentum transfer, whereas linear motors derive their propulsion from electromagnetic interaction. As a result, linear motors can offer powerful and precise motion control, distinct from the characteristics of traditional combustion-based propulsion.

A promising extension of this electromagnetic propulsion system is the idea of "recycling the flow" within a linear motor system. Rather than a one-time application of force, energy could be recaptured, redirected, or sustained in a cyclical process. By optimizing the recycling of electromagnetic force, linear motors improve their efficiency, reduce energy loss, and enhance sustained propulsion, potentially revolutionizing propulsion mechanisms across various fields, from transportation to industrial automation.

3. Conclusion

In the future of transportation, electromagnetic thrusters are poised to be transformative. With the capability to operate on roads, off-road, in water, in the sky, and even in outer space, these thrusters are set to revolutionize the way we travel. By connecting to a source of electrical power, electromagnetic thrusters can generate highly efficient thrust, allowing them to move payloads with ease. This makes electromagnetic thrusters vastly superior to any other propulsion device. By harnessing electrical energy, they surpass any conventional propulsion system. This groundbreaking ad-

vancement fundamentally changes how we think about transportation.

The inventor seeks a suitable entrepreneur or investor to collaborate on realizing this vision. If you possess the foresight and resources necessary to bring this initiative to fruition, we encourage you to take action at this juncture.

Abbreviations

EMP	Electromagnetic Propulsion
EMT	Electromagnetic Thruster
LM	Linear Motor

Author Contributions

Leelananda Jayasuriya is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

References

- [1] Jayasuriya, L. (2024, January 22). Electromagnetic thruster. https://www.ljindustries.com/Electromagnetic_thruster.pdf/ Retrieved April 24, 2025).
- [2] Jayasuriya, L. (2024, December 04) https://www.ljindustries.com/thruster_wear.htm Personal sky rider (Retrieved April 24, 2025).
- [3] Jayasuriya, L. (2024, December 03). Future car flying trend https://www.ljindustries.com/thruster_fly.htm (Retrieved April 24, 2025).
- [4] Jayasuriya, L. (2024, December 03). Flying vehicles for public transport https://www.ljindustries.com/thruster_bus.htm (Retrieved April 24, 2025).
- [5] Jayasuriya, L. (2024, December 03). Future vehicles for cruising in water https://www.ljindustries.com/thruster_marine.htm (Retrieved April 24, 2025).
- [6] Jayasuriya, L. (2024, December 03). Satellite launcher, The future trend https://www.ljindustries.com/thruster_sat.htm (Retrieved April 24, 2025).
- [7] Jayasuriya, L. (2024, December 03). Electromagnetic thruster <https://www.ljindustries.com/thruster.htm> (Retrieved April 24, 2025).