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Installing Laser Weapons on Combat Vehicles

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Situation

- Interceptor missiles are expensive, starting from \$50,000 each, and have an accuracy of around 20% [1]
- Interceptor missiles take time to reach the targeted rocket, making such kinetic countermeasures an infeasible solution [2]
- Laser weapons have been successfully tested on aircrafts, but they consume too much energy. A better platform for the laser is a combat vehicle

Problems

- Providing the large platform needed for the laser weapon
- Preventing the laser weapon from overheating
- Protecting the laser weapon from the environment and attacks
- Preventing leaking electromagnetic radiation from harming the operator and surrounding environment



Figure 1: Laser Module [3]

Solutions

- An eight-wheel military truck will provide the space needed for the laser and the 100kW diesel generator that runs the laser
- Cooling system consists of the liquid in the laser which provides circulation, and fans which remove heat from the vehicle
- A metal dome will cover and protect the laser
- A Faraday cage surrounds the laser to limit the radiation

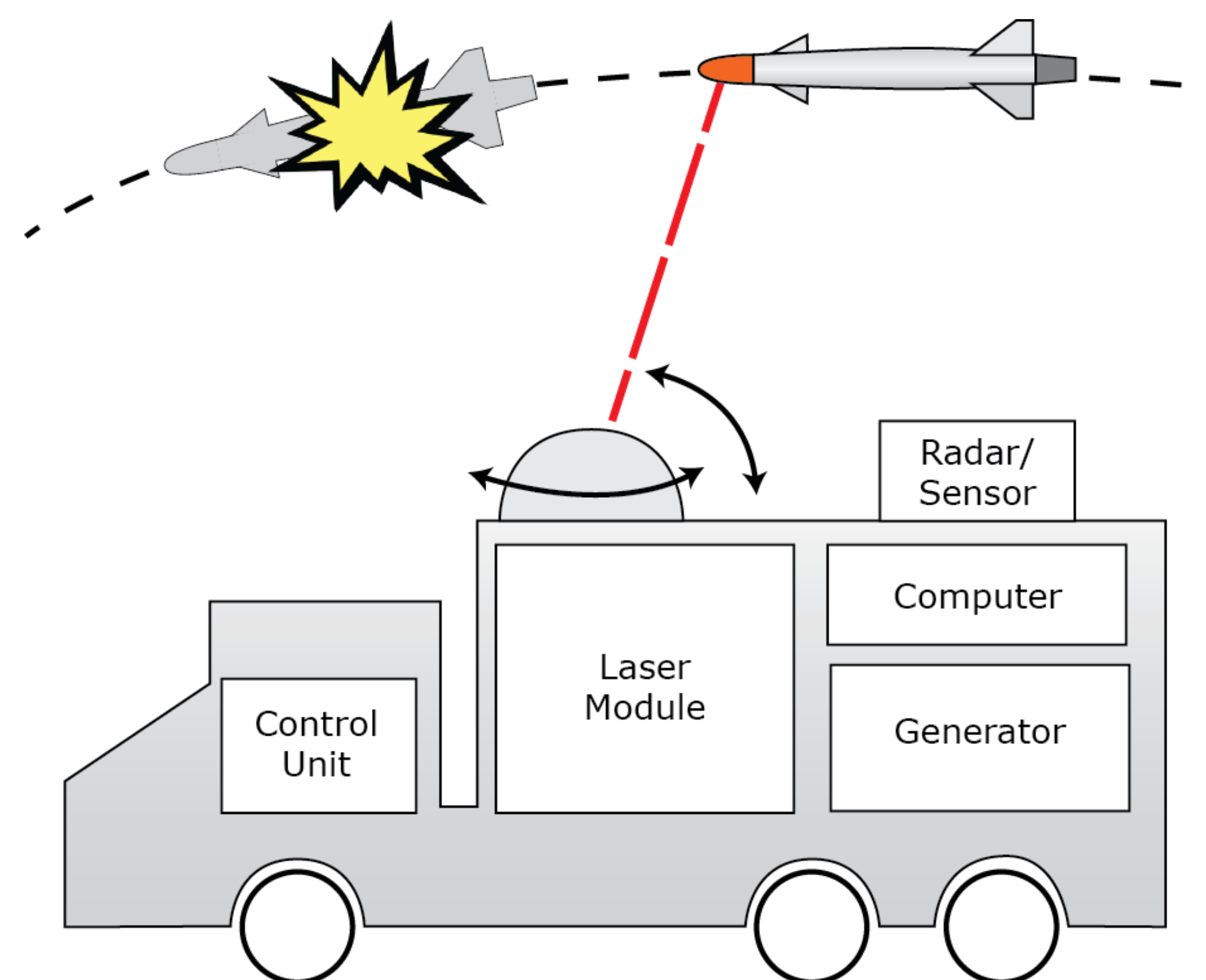


Figure 2: Internal structure of the laser vehicle

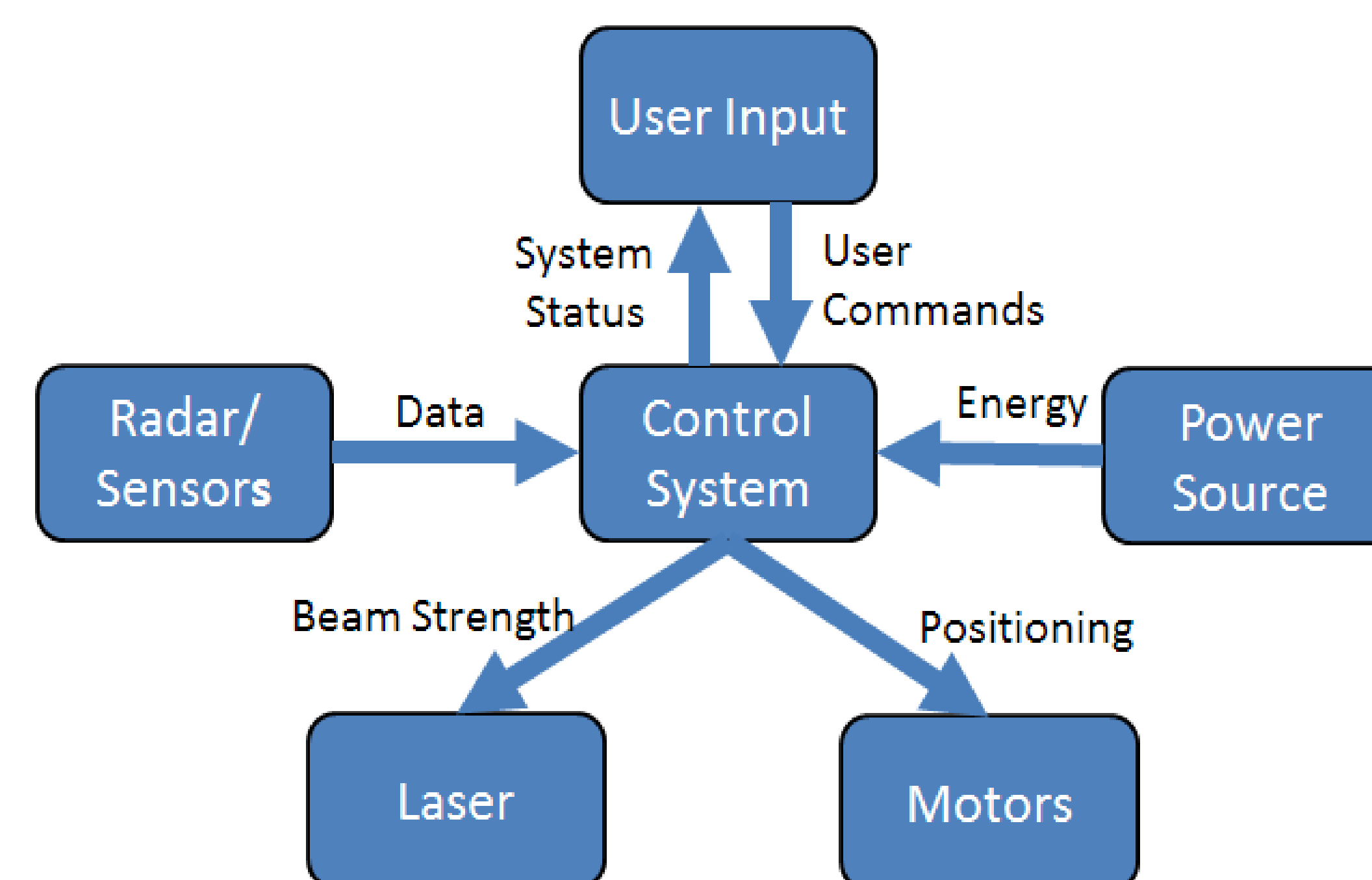


Figure 3: System Overview

Evaluation

- Initial cost of such a system will be fairly high
- Generator has a fairly long startup time, so it can't be used immediately in emergency situations
- Laser beam loses 30-50% of its energy while travelling through the air, so more time needed to destroy the target [4]
- Truck has a weight of 19 tons, so it can't move quickly or be used in stealth operations

Table 1: Comparison between interceptor missiles and laser

Criteria	Interceptor Missile	Laser Vehicle
Initial Cost	\$70M	\$80M
Running Cost	\$50k per missile	\$10 per minute
Time needed to destroy target after detection	2 minutes	7-40 seconds
Percentage of targets destroyed	20%	80%

References

- [1] Defense Science Board, "Patriot System Performance Report Summary," Office of the Under Secretary of Defense For Acquisition, Technology, and Logistics, Washington, D.C., 2005.
- [2] R. Ponack, "Assessing Capabilities of the High Energy Liquid Laser Area Defense System Through Combat Simulations," Wright-Patterson Air Force Base, Ohio, 2008.
- [3] "Scorpion Patrol Ship – Self Defense Weaponry," [Online]. Available: http://www.solarnavigator.net/world_solar_challenge/scorpion_autonomous_boat_self_defence_weaponry.htm. [Accessed: Dec. 6, 2013]
- [4] P. Sprangle, J. Pefiano and B. Hafizi, "Optimum Wavelength and Power for Efficient Laser Propagation in Various Atmospheric Environments," Naval Research Laboratory, Washington, DC, 2005.