



LASER GUNS: A LEAP IN MISSILE DEFENCE TECHNOLOGY

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Israel is making a major leap in missile defence technology by integrating laser guns to its systems.ⁱ However, the planned system, at present, is intended to intercept and destroy incoming rockets and mortars, but it will, in a way, act as a concept demonstrator to prove the efficacy of using laser guns to intercept ballistic projectiles. Israel currently has deployed the Iron Dome system for the task which uses rocket propelled and guided interceptors to intercept the incoming projectiles. Though the Israeli government had claimed that the system intercepted 90% of the incoming rockets, independent analysis shows that the success rate is far less compared to the official claim. The Iron Dome system has certain disadvantages as far as the interceptor is concerned. The cost of the interceptor is too high compared to the rudimentary armed rockets fired by the Palestinian militant groups and hence the cost- benefit ratio is a major concern. Taking advantage of this drawback, militant groups can increase production of those cheap rockets to several thousands and fire them to saturate the Iron Dome system. The other disadvantage of the Iron Dome interceptor, when compared to laser guns, is that it is restricted by G load factor which affects manoeuvrability.

Israel is a major victim of frequent rocket attacks from Palestinian militant groups. The groups attack with rockets called 'Quassam rockets' which are homemade rockets built with easily available materials and are unguided, and these attacks are said to be funded by Iran. Recently, an architect of Israeli missile defence programme Dr. Uzi Rubin warned that these rockets could become more sophisticated in the future as the adversary could possibly use GPS and other homing technologies to make it smart rockets. Israel's policy of

punishing the aggressor with heavy military strikes has not deterred the enemy from repeating such attacks. This could have been the reason for Israel to develop the Iron Dome defence system that defends the Israeli population from such attacks.

With the development of the laser based defence system dubbed 'Iron Beam', Israel's defence against rockets and mortars will get stronger. The system is manufactured by the state owned Rafael Advanced Defense Systems Ltd which is expected to be unveiled at the Singapore Air Show in mid-February this year.ⁱⁱ The radars will track the incoming projectiles and will continuously direct the laser beam on the target. The laser beam will superheat the projectile and destroy it.

Lasers have certain advantages over rocket powered interceptors; Firstly, they are cheaper. "The U.S. Navy unveiled a ship-borne laser weapon whose shots cost about \$1 a piece, which radically changes the cost calculation of offense and defence."ⁱⁱⁱ Secondly, the entire process of guiding the rocket powered missile interceptor is removed in a laser based system as the system just needs to adjust the angle of the laser transmitter. Thirdly, the magazine is unlimited, as the laser gun can keep firing as long as the power supply remains. Additionally, the penetrating capacity of attacking manoeuvrable re-entry warhead is degraded.

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The threat faced by Israel is not only from small rockets and mortars, but also from long range ballistic missiles. Iran has developed a variety of ballistic missiles like Shahab-3, Sajjil-2 which are capable of reaching Israel. According to Dr. Uzi Rubin, "Iran possesses over 400 ballistic missiles that can reach Israel, with warheads of 750 kgs. Syria possesses 200 to 300 ballistic missiles and Syria and Hezbollah have thousands of heavy rockets, and tens of thousands of light rockets."^{iv} Hence Israel has developed and is developing missile

defence systems capable of intercepting missiles with varying ranges like the Arrow-2, Arrow-3 and David Sling. The Arrow 3 and the David Sling systems are in the testing stage at present. Integrating all these systems would provide Israel a multi layered defence against missiles. If the Iron Beam, laser based system, proves to be successful, then it is possible in the future to adopt laser guns for defence against longer range ballistic missiles too. Israel is not the only country to have developed a laser based defense system to defend against mortar, UAVs and small rockets. The United States had already demonstrated a system called Area Defence Anti-Munitions (ADAM) developed by Lockheed Martin. This is a “transportable, ground-based laser system to provide a defence against short-range threats, including improvised rockets such as Qassam rockets, unmanned aerial systems and small boats.”^v With these directed energy weapons the future of missile defence appears promising. These types of systems will also be very effective against cruise missiles, both anti-ship and land attack. Powerful laser guns can be very effective for terminal defence against sub-sonic cruise missiles as the laser will be able to deliver higher energy for any given distance travelled by the missiles.

Directed energy weapons are the next generation technology for missile defence systems and have the potential to turn the balance in favour of the defender. However, some counter-measures against these types of weapons already exist like the technique of rotating the rocket to spread the heat away from one particular spot. Other counter-measures could also be developed in future to increase the penetrating capacity of the attacking missiles. However, directed energy technology is also expected to evolve with the use of other technologies like the High Power Microwave (HPM) systems. At present, Israel and United States are taking the lead in employing lasers for missile defence.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies CAPS)

Endnotes

ⁱ Sharona Schwartz, “Israeli Company to Roll Out Defense System That Incinerates Incoming Rockets Midair Using Lasers”, *The Blaze*, 19 January 2014, See <http://www.theblaze.com/stories/2014/01/19/israeli-company-to-roll-out-defense-system-that-incinerates-incoming-rockets-midair-using-lasers/>

ⁱⁱ Kelsey D. Atherton, “Laser to Join Israel’s Missile Defense System”, *Popular Science*, 22 January 2014, See <http://www.popsci.com/article/technology/lasers-join-israels-missile-defense-system>

iii Ibid

iv Yaakov Lappin, "Miaaile Defense Experts Warns of Growing Strategic Threat", *The Jerusalem Post*, 15 January 2014, See <http://www.jpost.com/Defense/Precision-guided-rockets-missiles-becoming-strategic-threat-architect-of-missile-defense-system-warns-338299>

v "Lockheed Martin Demonstrates ADAM Ground Based Laser System in Increasingly Complex Tests Against Free Flying Rockets", 8 May 2013, See <http://www.lockheedmartin.com/us/news/press-releases/2013/may/0507-ss-adam.html>

