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## **American Global Defense: The Speed of Light Weapons**

*By Dr. Oded Amichai*

The current threat of terrorism to the entire free world may appear immature in the very near future when one of these countries, with the active support of Russia, Ukraine, China, North Korea, Pakistan or France, reaches nuclear weapon's capability. While these countries already possess chemical and biological weapon potential, the combination of unconventional weapons with ballistic missiles capacity will no doubt be disastrous.

Israel, being a small country, whose population is centered in a narrow strip of land on the Mediterranean coast, is especially sensitive to the ballistic missiles threat, even with the conventional warheads, which its Arab neighbors collect in huge quantities. Despite President Bush's justified actions against states of the "axis of evil", most chances are that one of these countries will reach nuclear weapon capability, while Pakistan and North Korea should be indicated as dangerous instances.

The free world will not feel safe until the threat of ballistic missiles with unconventional warheads is eliminated. There are various ways to deal with this threat – deterrence, passive defense, destruction of the missile launching systems and interception of the missiles – either by defense missiles or lasers.

The deterrence concept, which was announced in the US in the early 60's, claims that deterrence is sufficient to prevent attack against civilian population, at least with unconventional weapons. This model, which was successful during the Cold War, collapsed together with the Soviet Union in the early 90's and is insufficient against the new terror supporting countries.

The passive defense is aimed at minimizing damages and casualties by means of warning, shelters, protection masks, vaccination, emergency services and evacuation. The efficiency of this method is limited; it involves vast investment without preventing the destruction of the country's economic and defense infrastructure, not to mention the civilian's casualties.

Destruction of missile launching systems by cruise missiles, long range ground missiles and air strike – all equipped with state of the art guidance systems like GPS, radar or electro-optics (lasers, TV or thermal imaging) is certainly both an effective and necessary method to preclude this threat. This approach has become all the more effective with the real-time intelligence that the current satellites and MRPV (mini remotely-piloted vehicles) are able to supply. Nevertheless, this method is limited by two major difficulties: a) it is unable to assure absolute destruction of the enemy's missile launching systems especially when most of them are mobile, and b) it is justly been accepted as an aggressive step, which cannot always be taken.

Raytheon's Patriot missiles (pac-2 model), originally designed against airplanes, were used in the 1991 Gulf War to defend both Israel and Saudi Arabia from the Iraqi Scud missiles. There was no record of any Patriot successfully destroying a single Scud missile. Since then the missile defense technology has significantly developed. Raytheon's new Patriot missiles (pac-3 model) are specially designed to intercept short-range missiles, and the joint Israeli-American project of the medium range Arrow Missiles has reached preliminary maturity (prime contractor is IAI – Israel Aircraft Industries). At the same time, Lockheed-Martin's long-range missile defense project (THAAD – Theater High-Altitude Area Defense) is still under development.

Unfortunately, the concept of intercepting high-speed ground missiles with the use of ground defense missiles is inherently limited. The kill probability is low and aggressors will

always have the advantage of surprise, while the defender is inferior against long-range – high-speed missiles, especially with maneuvering or splitting capabilities. Moreover the cost of defending missiles is ten fold in comparison to the aggressor missiles thus posing a substantial economic difficulty.

The high-power laser solution excited the imagination of most scientists back in the late 60's, only a few years after its invention. Traveling at the speed of light, the time difference between target identification and its interception is negligible. Thus warning time increases, response time shortens, the speed of the aggressor missile is irrelevant and kill probability is high. Moreover, economically the cost of laser interception amounts to 1% of the cost of the aggressor's missile, therefore making it the most efficient and effective solution. The speed-of-light weapon opens a whole new dimension. Shortly after target identification, the laser beam locks on target, destroying the aggressor missile in a fraction of its traveling time. Subsequently, rendering high-speed missiles, as well as maneuvering or splitting warheads completely obsolete.

Ground-based lasers with limited mobility suffer from atmospheric propagation problems that shorten the interception range and therefore are less attractive. Airplane-based lasers will - within the coming decade certainly become the winning horse neutralizing the power of traditional weapons such as cruise and ballistic missiles with either conventional or unconventional warheads. Airplane-based lasers will be used to defend bombers over enemy's territory and to intercept enemy ballistic missiles as soon as they are launched, at ranges of a few hundred kilometers. Space-based lasers will appear later, increasing the missiles interception range to thousands of kilometers. Whoever owns the speed-of-light weapon will dominate the battle-space in almost every respect. There is no doubt that the US is dominant in laser technology. Airplane-based lasers and space-based lasers are being developed internally, while ground-based lasers against artillery rockets and short-range missiles are being developed jointly with Israel.

Time is of the essence. Nations like Iran, Syria and Libya could accumulate a stockpile of tens of thousands of ballistic missiles equipped with chemical or biological weapons, and eventually nuclear warheads as well. If this happens before the US gains control on the speed-of-light weapon the current wars in Afghanistan and Iraq may seem like child's play.

*Dr. Amichai is an Israeli physicist, specialist in lasers and electro-optics, with extensive experience in the Israeli defense and industrial business.*