

## Sky Guard – From The Expert’s Mouth

By: Dr Oded Amichai, Omedia - The Security Agenda, 12.08.2006

*Dr Oded Amichai, former senior Rafael representative, counters arguments against the Sky Guard laser defense system, describe its advantages and reveals who is to blame for it not being in operation in Israel today*

There have been rumors and prejudicial lies told about the Sky Guard rocket interceptor laser defense system. The following lists ten of the fabrications:

### **“The system is transported in 20 trailers and requires 100 operates to fire it”**

Sky Guard is the mobile production model, derived from the Nautilus (THEL – Tactical High Energy Laser), it requires 3 trailers, not especially large ones, and can be transported from place to place in a day. A mobile model is not needed to defend localities and quality targets. Sky Guard is operated and monitored by a computer, which requires two operators.

### **“The system has a short range of less than 3 km”**

Sky Guard has a range of 10 km. The mobile derivative (MTHEL) of Nautilus has a short range, which on US army orders, reduced the system size at the expense of its performance. Work on developing the mobile model (MTHEL) ceased in 2005.

### **“Huge amounts energy are required to generate the deadly laser beam”**

So what? “Huge amounts” of energy are also needed for a plane to cross the Atlantic. The source of this “huge amount” of energy is from burning a fuel similar to rocket fuel. It was a breakthrough in the development of high-powered lasers, which took place in the early 1970s at the same time in American and Israel, and later in the USSR.

### **“The system has a low firing rate. Each time the system is fired it has to be resupplied”**

Sky Guard needs about one second to intercept a target and can operate continuously without limitation, attacking one target after another. The laser is the only system, which can intercept a volley of fire. Back in 1978, the results were published of a test in White Sands involving a similar system, which intercepted Tau missiles fired in volleys. Nautilus can also intercept volleys of rockets and artillery projectiles, as this video clip which was shot in White Sands shows.

### **“The system does not work in cloudy conditions”**

You have the same problem with electro-optic guided missiles, planes, observation satellites, drones, and other devices. So what? So you don’t use them? Most of the time the skies in Israel are clear, even in winter. Unlike other systems, the laser can correct some of the atmospheric disturbances and intercept targets at a shorter range, or take longer over it without reducing its effectiveness.

### **“The system emits toxic gases and endangers the environment”**

The laser emission gas (HF – hydrofluoric acid) is from the same family, though less dangerous than the emission gases of other rocket systems (HCL – hydrochloric acid). Unlike rocket systems, it is easy to absorb the laser emission gases, and there is a special absorption unit, though it was withdrawn from use due to lack of need.

### **“The Americans are developing a new solid-state leaser technology”**

So what? Should we wait 10 years for the next generation which might not be a solid-state laser? Didn’t the world use telephones before the third generation cell phones came along. Didn’t the airforce use air-to-air missiles before the Python 5? On the contrary, there is no

precedent for developing a successful advanced generation before implementing and using the previous generation.

**“We will need hundreds of systems at an investment of billions of dollars to defend the northern border and western Negev locations”**

To defend the western Negev locations against Kassam fire, will require 3-4 Sky Guard systems, at a total estimated cost of 250-300 million dollars. A large portion of the cost is likely to be funded by the American Congress. 10-12 systems would be needed to defend the northern border at an estimated cost of 400 million dollars.

**“A number of Israeli alternatives based on a relatively cheap missile are being developed”**

This is the main problem – the defense establishment prefers a locally made kinetic solution (based on a “relatively cheap” missile – even if it is unavailable, ineffective, and has high operating costs). No local solution will be ready in the next five years. However, the development of the Nautilus ended in 2000 and dozens of interception trials of rockets, artillery projectiles, and mortars have been conducted in one of the largest and most sophisticated trial sites in the world – White Sands – in both single shots and volleys trials with 100% success, which is remarkable by any standard. On the other hand, the chances of intercepting short-range rockets using missiles is small to zero, especially against rockets fired in volleys. This was demonstrated in the first Gulf War (1991), when the Patriot system failed to intercept dozens of Kassams fired from Iraq. 100% failure of the Patriot against 100% success of the laser intercept tests. Why invest in a solution with low chances of success to begin with?

Sky Guard’s operating cost is low, about \$1000 a shot. This compares with over \$100,000 a shot for every solution involving kinetic interception (based on “relatively cheap” missiles). Even if we assume that we could intercept a Kassam or Katyusha with three such missiles (with a high chance of success), we would have needed to fire 12,000 missiles at a cost of \$1.2 billion to intercept the 4,000 rockets fired on the northern border in the second Lebanese war. And what would happen in a war on a bigger scale? On the other hand, the cost of intercepting those 4000 rockets using Sky Guard is only \$4 million. Sky Guard is available, effective, and cheapest of all the above alternatives.

**“The company would not provide system data because the American government has forbidden it to disclose the full description of the technology”**

Fault? – it’s all Israel’s fault. The defence establishment was in no hurry and was not interested in the data. If one of the prime ministers since 2000 had asked the US president for it the system would have been here long ago.

Now to the crunch, I believe that abandoning Israel’s home front to a relentless barrage of missiles and rockets was one of the greatest failures in Israel’s history. If laser systems had been deployed where they should have been, they would have intercepted most of the rockets fired on Israel and the confrontation with Hamas and Hizbollah would be fundamentally different. There are no laser systems, not because of a technical difficulty or budget constraints, but because of misguided policy of the Israel defense establishment, which was wrong in its assessment of the rocket threat, and prefers locally developed systems for arms export reasons. Most of the blame must be leveled at previous governments, which ignored the threat and its solution, which was within reach. In fact, the present government, which has been strongly castigated for the failures of the war, some of which it is not to blame for, identified the threat before the war and is taking steps to do something about it.

*Physicist, Dr Oded Amichai, is a laser systems expert and consultant in the commercial development of lasers and electro-optics. He served as the head of the physicality department at Rafael, and is the Chief Engineer at the Center for Advanced Development (Elron). He is the founder, CEO, and President of Optomic, a satellite communication and*

*commercial lasers company. He was one of the fathers of the Nautilus program and supervised it voluntarily from its start until today.*