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Targeting the pain business

US-based Raytheon is marketing microwave weapon systems that 'fill the gap between shout and shoot'. But who will use them and why, ask Steve Wright and Charles Arthur

Steve Wright and Charles Arthur

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Imagine you're at a protest - at a nuclear plant, perhaps, or a military installation. You approach the perimeter fence, carrying your placard. The loudhailers warn you to keep away. But you ignore them; this is a protest, after all. And then it happens. Your skin feels as if it's on fire - a burning, relentless, intense pain as if you were touching a frying pan. You scream and jump back, trying to escape the sudden agony. You scrabble a few metres away and it stops. Then you look closer at the buildings that are the object of your protest. Did it come from there? You approach the fence again and the pain starts again - until you jump back.

That's the sort of scenario envisaged by Raytheon, an Arizona-based defence company. It has developed what it calls a "less-than-lethal directed energy projection system", trademarked Silent Guardian, and says it is "available now and ready for action".

The question is, action against whom? The \$10m Silent Guardian weapon is part of a family of Raytheon's directed energy weapons, which also includes the larger Vigilant Eagle System, a high-powered microwave antennae the size of an advertising hoarding designed to fry the electronics of incoming shoulder-launched surface-to-air missiles up to 60 miles away, and the vehicle-mounted Active Denial System, which operates beyond small arms range (about 500 metres).

All are in the business of handing out pain. The human effects were evaluated by Sandia Laboratories and the Air Force Research Laboratories. Their findings: "This technology is capable of rapidly heating a person's skin to achieve a pain threshold that has been demonstrated by AFRL human subject testing to be very effective at repelling people, without burning the skin or causing other secondary effects." The device, it adds, "is an alternative to lethal force."

Skin deep

The human testing showed that the beams will penetrate even tiny openings and cracks in any physical barrier, including clothes, walls and shields. It is as though it wraps around corners to affect any piece of exposed body - the fingers or face, say, of those trying to hide.

Silent Guardian works by projecting a beam of microwave energy at a frequency of 94GHz up to a range of 250 metres. Raytheon says there is no comparison with radiation from a microwave oven, with a much higher frequency, and that it only penetrates the first skin layer, the epidermis, to a depth of 0.4mm, no matter how close to the beam you are. That's deep enough to trigger the sensory nerves in the skin. However, Andrew Rice, a consultant in pain medicine at Chelsea and Westminster Hospital in London, told New Scientist last year that "even if the use of temporary severe pain can be justified as a restraining measure, which I do not believe it can, the long-term physical and psychological effects are unknown".

What is clear is that this weapon ushers in a new era of paralysing weapons for urban warfare and, potentially, a techno-politics of border exclusion and crowd control. Raytheon insists that although pain is produced instantaneously, it will cause no damage, apparently on the assumption that targets will move away at once.

It is a big system, about 2.5 metres high and weighing more than 4,500kg, intended for static operations including checkpoint security, perimeter, road clearing and point defence, embassy protection, homeland security and peacekeeping missions. The marketing video shows a stationary firing position controlled by a joystick that Raytheon says shoots two-second bursts of energy and has an automatic tracking facility, useful for targeting individuals, although it also opens up the possibility of future automatic systems.

The first users are likely to be nuclear power installations or other high security zones where lethal force is already authorised, according to the Nuclear Control Institute (www.nci.org/g-h/hirschtb.htm). Raytheon says that since the level of skin penetration is so low, the weapons is harmless and "fills the gap between shout and shoot". But what's not known yet is how much energy is transferred to the target, which might open up physical weaknesses. Tests carried out with the Active Denial System at Kirkland Air Force Base in New Mexico between 2003 and 2004 raised questions about the safety of this technology in practice, since volunteers were asked to remove glasses and contact lenses to avoid the possibility of eye damage. Volunteers were also asked to remove metallic objects next to the skin to prevent hot spots forming. Demonstrators might not be so cooperative.

Raytheon says that to experience a true burn, you would have to be exposed to the beam for 250 seconds - more than four minutes. The antenna on Silent Guardian that projects the beam also contains infrared sensors: these are claimed to be sensitive enough to detect any excessive skin heating and alert the operator to move off that target.

But are they? And would they? Amnesty International has repeatedly expressed concerns about "push-button torture". UN special rapporteur on torture Theo van Boeven warns of a generation of "non-lethal weapons" that he describes as "including devices which employ high-decibel sounds and microwaves ... these technologies have the potential to be used for torture and ill treatment if abused".

In Britain, the Threshold Group has been set up at Leeds Metropolitan University, with experts on sub-lethal and unconventional weapons, to monitor and challenge unconventional military technologies. The group is worried these weapons will come to redefine existing standards of cruelty and democracy and undermine legal arrangements, and that existing oversight controls and international humanitarian law is not yet developed enough to adapt. But where might the weapon be used first? According to a 2004 article in the Stars and Stripes magazine (tinyurl.com/naa4x), the US army wanted to use it in Iraq.

Deployment decision

For a time nothing happened. "We know the army has requested it. No decision on deployment has been made," a Pentagon spokeswoman said in January. Jack Fischer, a Raytheon spokesman, told the US Air Force's newsletter: "I don't know of any issues that would cause a problem," and speculated that the military might just be deciding where in Iraq to put it.

Then last month in an interview with the US press, the US secretary of the Air Force, Michael Wynne, offered an equivocal opinion about the use of non-lethal weapons. "Non-lethal weapons are still being reviewed by the medical group ... Basically my point to them was [that] we need to start using that here in the US on Americans. And if we start using that here on

Americans ... the first thing they will do is cry out that you have hurt them medically in a way that is pejorative."

Crucially, the secretary added: "So I think we should use it, if we're not willing to use it here, against our fellow citizens, then we should not be willing to use it in a wartime situation." His statement was interpreted initially as recommending the use of non-lethal weapons. But a more careful reading suggests that he may have been warning against their use.

All that's clear at present is that Raytheon has not yet sold its Silent Guardian to the US military. But that doesn't mean it won't. "Right now it's the stuff of great novels," chided Wynne. But so, once, was the idea of erasing the past and watching the population via remote cameras. Just because a technology sounds futuristic doesn't mean it won't be used.

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