

Say Hello to the Goodbye Weapon: New “Nonlethal” Micro-wave Weapon used in Iraq

US Air Force's Active Denial system

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The crowd is getting ugly. Soldiers roll up in a Hummer. Suddenly, the whole right half of your body is screaming in agony. You feel like you've been dipped in molten lava. You almost faint from shock and pain, but instead you stumble backwards — and then start running. To your surprise, everyone else is running too. In a few seconds, the street is completely empty.

You've just been hit with a new nonlethal weapon that has been certified for use in Iraq — even though critics argue there may be unforeseen effects.

According to documents obtained for Wired News under federal sunshine laws, the Air Force's Active Denial System, or ADS, has been certified safe after lengthy tests by military scientists in the lab and in war games.

The ADS shoots a beam of millimeters waves, which are longer in wavelength than x-rays but shorter than microwaves — 94 GHz (= 3 mm wavelength) compared to 2.45 GHz (= 12 cm wavelength) in a standard microwave oven.

The longer waves are thought to limit the effects of the radiation. If used properly, ADS will produce no lasting adverse affects, the military argues.

Documents acquired for Wired News using the Freedom of Information Act claim that most of the radiation (83 percent) is instantly absorbed by the top layer of the skin, heating it rapidly.

The beam produces what experimenters call the “Goodbye effect,” or “prompt and highly motivated escape behavior.” In human tests, most subjects reached their pain threshold within 3 seconds, and none of the subjects could endure more than 5 seconds.

“It will repel you,” one test subject said. “If hit by the beam, you will move out of it — reflexively and quickly. You for sure will not be eager to experience it again.”

But while subjects may feel like they have sustained serious burns, the documents claim effects are not long-lasting. At most, “some volunteers who tolerate the heat may experience prolonged redness or even small blisters,” the Air Force experiments concluded.

The reports describe an elaborate series of investigations involving human subjects.

The volunteers were military personnel: active, reserve or retired, who volunteered for the

tests. They were unpaid, but the subjects would “benefit from direct knowledge that an effective nonlethal weapon system could soon be in the inventory,” said one report. The tests ranged from simple exposure in the laboratory to elaborate war games involving hundreds of participants.

The military simulated crowd control situations, rescuing helicopter crews in a Black Hawk Down setting and urban assaults. More unusual tests involved alcohol, attack dogs and maze-like obstacle courses.

In more than 10,000 exposures, there were six cases of blistering and one instance of second-degree burns in a laboratory accident, the documents claim.

The ADS was developed in complete secrecy for 10 years at a cost of \$40 million. Its existence was revealed in 2001 by news reports, but most details of ADS human testing remain classified. There has been no independent checking of the military’s claims.

The ADS technology is ready to deploy, and the Army requested ADS-armed Strykers for Iraq last year. But the military is well aware that any adverse publicity could finish the program, and it does not want to risk distressed victims wailing about evil new weapons on CNN.

This may mean yet more rounds of testing for the ADS.

New bombs can be rushed into service in a matter of weeks, but the process is more complex for nonlethal weapons. It may be years before the debates are resolved and the first directed-energy nonlethal weapon is used in action.

The development of a truly safe and highly effective nonlethal crowd-control system could raise enormous ethical questions about the state’s use of coercive force. If a method such as ADS leads to no lasting injury or harm, authorities may find easier justifications for employing them.

Historically, one of the big problems with nonlethal weapons is that they can be misused. Rubber bullets are generally safe when fired at the torso, but head impacts can be dangerous, particularly at close range. Tasers can become dangerous if they are used on subjects who have previously been doused with flammable pepper spray. In the heat of the moment, soldiers or police can forget their safety training.

Steve Wright of Praxis, the Center for the Study of Information and Technology in Peace, Conflict Resolution and Human Rights, notes that there are occasions when this has happened in the past. He cites British soldiers, who increased the weight of baton rounds in Northern Ireland.

“Soldiers flouted the rules of engagement, doctoring the bullets by inserting batteries (to increase the weight) and firing at closer ranges than allowed,” says Wright.

There may also be technical issues. Wright cites a recent report on CS gas sprays which turned out to be more dangerous in the field than expected.

“No one had bothered to check how the sprays actually performed in practice, and they yielded much more irritant than was calculated in the weapon specification. This underlines

the need for independent checking of any manufacturers' specifications. Here secrecy is the enemy of safety."

Eye damage is identified as the biggest concern, but the military claims this has been thoroughly studied. Lab testing found subjects reflexively blink or turn away within a quarter of a second of exposure, long before the sensitive cornea can be damaged. Tests on monkeys showed that corneal damage heals within 24 hours, the reports claim.

"A speculum was needed to hold the eyes open to produce this type of injury because even under anesthesia, the monkeys blinked, protecting the cornea," the report says.

The risk of cancer is also often mentioned in connection with the ADS system, despite the shallow penetration of radiation into the skin.

But the Air Force is adamant that after years of study, exposure to MMW has not been demonstrated to promote cancer. During some tests, subjects were exposed to 20 times the permitted dose under the relevant Air Force radiation standard. The Air Force claims the exposure was justified by demonstrating the safety of the ADS system.

The beam penetrates clothing, but not stone or metal. Blocking it is harder than you might think. Wearing a tinfoil shirt is not enough — you would have to be wrapped like a turkey to be completely protected. The experimenters found that even a small exposed area was enough to produce the Goodbye effect, so any gaps would negate protection. Holding up a sheet of metal won't work either, unless it covers your whole body and you can keep the tips of your fingers out of sight.

Wet clothing might sound like a good defense, but tests showed that contact with damp cloth actually intensified the effects of the beam.

System 1, the operational prototype, is mounted on a Hummer and produces a beam with a 2-meter diameter. Effective range is at least 500 meters, which is further than rubber bullets, tear gas or water cannons. The ammunition supply is effectively unlimited.

The military's tests went beyond safety, exploring how well the ADS works in practice. In one war game, an assault team staged a mock raid on a building. The ADS was used to remove civilians from the battlefield, separating what the military calls "tourists from terrorists."

It was also used in a Black Hawk Down scenario, and maritime tests, which saw the ADS deployed against small boats.

It might also be used on the battlefield. One war game deployed the ADS in support of an assault, suppressing incoming fire and obstructing a counterattack.

"ADS has the same compelling nonlethal effect on all targets, regardless of size, age and gender," says Capt. Jay Delarosa, spokesman for the Joint Non-Lethal Weapons Directorate, which decides where and how the ADS might be deployed.

"It can be used to deny an area to individuals or groups, to control access, to prevent an individual or individuals from carrying out an undesirable activity, and to delay or disrupt adversary activity."

The precise results of the military's war games are classified, but Capt. Delarosa insists that the ADS has proven "both safe and effective in all these roles."

The ADS comes in a variety of shapes and sizes. As well as System 1, a smaller version has been fitted to a Stryker armored vehicle — along with other lethal and nonlethal weapons — for urban security operations. Sandia National Labs is looking at a small tripod-mounted version for defending nuclear installations, and there is even a portable ADS. And there are bigger versions too.

"Key technologies to enable this capability from an airborne platform — such as a C-130 — are being developed at several Air Force Research Laboratory technology directorates," says Diana Loree, program manager for the Airborne ADS.

The airborne ADS would supplement the formidable firepower of Special Forces AC-130 gunships, which currently includes a 105-mm howitzer and 25-mm Gatling guns. The flying gunboats typically engage targets at a range of two miles or more, which implies an ADS far more powerful than System 1 has been developed. But details of the exact power levels, range and diameter of the beam are classified.

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