

SOUND IN THE MACHINE

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SUMMARY

Spoiler warning: I have almost nothing positive to report on sonic weaponry. Whatever goes by that name is both over-hyped and ineffective. But in this is a disconcerting catch. Even if sonic weapons aren't strong enough to tear people's guts apart in combat, they are capable of causing serious damage to the ears and psyche. Labeled 'Non-Lethal Weapons,' these devices are most effectively used to harass private citizens, protesters and to aid in the torture of prisoners.

WORKS CITED

VISUAL / PRINT

Applied Research Laboratories (The University of Texas at Austin). "Non-Lethal Swimmer Neutralization Study (TECHNICAL DOCUMENT 3138)." 2002.

Altmann, Jürgen. "Acoustic Weapons—A Prospective Assessment: Sources, Propagation, and Effects of Strong Sound." Cornell University Peace Studies Program Occasional Paper #22. 1999. 5 June 2009 <<http://www.lasernegar.com/SCIENTIFIC/BOOK/OP22.pdf>>

Blenford, Adam. "Cruise Lines Turn to Sonic Weapon." BBC News. 8 November 2005. 30 June 2009 <<http://news.bbc.co.uk/2/hi/africa/4418748.st>>

Cusick, Suzanne G. "Music as torture / Music as weapon." Transcultural Music Review. 30 June 2009 <http://www.sibetrans.com/trans/trans10/cusick_eng.htm>

Coupland, R.M. (ed.). "The SIrUS Project—Towards a Determination of Which Weapons Cause 'Superfluous Injury or Unnecessary Suffering'." Geneva: International Committee of the Red Cross, 1997.

Jauchem, James R. and Michael C. Cook. "High-Intensity Acoustics for Military Nonlethal Applications: A Lack of Useful Systems." Military Medicine. 172:2 2007.

- Gierke, H.E. von Gierke and C.W. Nixon, "Effects of Intense Infrasound on Man." Infrasound and Low Frequency Vibration. W. Tempest ed. London and New York: Academic Press, 1976.
- Homer. "The Odyssey." Trans. Robert Fitzgerald. New York: Knopf, 1992.
- Monster, Flying Spaghetti & Joshua. "Joshua 6." Bible (Holy). Iron Age.
- Moore, C., J.N. Cole, E. Guild and H.E. Von Gierke. "Effects of Low Frequency and Infrasonic Noise on Man." Aerospace Medicine 36: 9, 1965.
- Onion, Amanda. "RNC to Feature Unusual Forms of Sound: Unusual Forms of Sound to Emanate From RNC." Aug. 25, 2004 . ABC News Science and Technology. 5 June 2009 <<http://abcnews.go.com/Technology/story?id=99472&page=1>>
- Osler, David. "Sonic solution many not be a sound investment." Lloyd's List. 2 December 2008. 1 June 2009 <<http://www.lloydslist.com/ll/news/sonic-solution-may-not-be-a-sound-investment/1228132740372.htm>>
- Phillips, Peter, Lew Brown and Bridget Thornton. "US Electromagnetic Weapons and Human Rights." Media Freedom Foundation, 2006.
- Stone, Alan M.D. "Report and Recommendations Concerning the Handling of Incidents Such As the Branch Davidian Standoff in Waco, Texas." 1993. 30 June 2009 <<http://www.pbs.org/wgbh/pages/frontline/waco/stonerpt.html>>

AUDITORY

- Apocalypse Now. Dir. Francis Ford Coppola. American Zoetrope, 1979.
- "Future Weapons." Discovery Channel. 10 May 2006. 30 June 2009. <<http://www.youtube.com/watch?v=myWxwNQfo-8>>

SOUND IN THE MACHINE

Sonic Weapons



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By Brian Snead

TRANSCRIPT

A sonic weapon is pretty much what it sounds like: using sound waves as weapons. And there are tons of them: the Long Range Acoustic Device, the Sonic Bullet, the Curdler (AKA People Repeller), the Shout, the Acoustic Blaster, the Hyperspike, the Acoustic Bazooka, the HyperSonic Sound System, the Aversive Audible Acoustic Device, the Gayle Blaster, the Acoustic Canon, the Sequential Arc Discharge Acoustic Generator, the Mosquito, and the Squawk Box. Basically, each of these is a take on one of two approaches: attack the hearing or attack the body.

To attack the hearing, loud, high frequencies are typically used. Imagine this sound

[fade in sample LRAD]

as loud as a jet engine. That's seriously painful and can be permanently damaging. And not just because it's loud or annoying as a sound, but because these sounds are engineered based on the frequencies and patterns that experimentation has revealed to be the most painful or disturbing for the human ear. But music is used, too, although not so much to attack the ears, but to strip identity, intimidate, and assert dominance (Cusick).

To target the body or other objects, extremely low frequencies, called 'infrasound,' at extremely high sound pressure levels (SPL) has been the most recent approach. Depending on who you ask, efforts were under way as early as the 1940s to build machines that could do this, but the idea's been around for a long time- the crumbling of the walls of Jericho is an interesting early possibility, however ridiculous it is. Modern explosives are much better for blowing up walls, so the approach now is to use acoustic energy to stress someone's internal organs to such a degree that the person will be incapacitated or killed. Yes, that really is the idea, to rip a person to pieces from the insides using sound waves.

Attack the hearing or the body; that's the basic set-up of sonic weaponry. Now, something I was debating in the writing of this was where exactly to put the part in about military-grade sonic weapons being a bunch of hype, with almost no successful results as battle-level weapons. Well, there it is. Extremely low acoustic energy does not tear people apart from the inside, try as the military might. Therefore, these things don't make very good weapons. In fact, their capabilities in that respect "have been grossly overstated" (Jauchem and Cook 182). As more and more researchers have pressed the literature for answers, it's revealed nothing more than myth.¹ Even though people the world over have been working on infrasound technology for decades, it's not difficult to understand why they've not been able to produce any solid results. The fundamentals of sound make such an outcome extremely unlikely and in many ways impossible. So, rather than attacking the body, more recent efforts have been directed at attacking the hearing. And because that approach only sometimes kills people, sonic weapons are usually classified as Non-Lethal Weapons (NLW), a class that also includes rubber bullets, anti-traction material (ATM), and tear gas. I say 'only sometimes kills people' because for an acoustic non-lethal weapon to have "value as a deterrent," one team of researchers writes, it "must reliably produce a consistent Bioeffect in the human body...[that] would affect the function and/or physical characteristics of major organs, limbs, or central nervous system" (Applied Research Laboratories 20). That's pretty serious stuff for something that is considered non-lethal. Luckily these kinds of weapons are slowly beginning to come under increased scrutiny in the international community because of their inhumane nature and use as instruments of torture (Phillips et al). No doubt about it, its unarmed people against whom sonic weapons are most effective. I'll return to this idea at the end, but keep in mind 'til then: using sound as a weapon is not a matter about which to be ambivalent, not for a citizen of a democratic society.

But popular conception seems to be that the sonic weapon is a success story, a modern-day breakthrough of technology and humanity. You may remember a few news spots about a device known as the "LRAD" repelling a pirate attack of the cruise ship *Seabourn Spirit* off the coast of Somali in 2005 (Blenford)—the event was a big deal and all that press helped to sell a lot of those units—but you probably haven't heard as much about a 2008 incident in which the LRAD did nothing at all to stop another band of pirates from overtaking a merchant vessel

¹ see Altmann; Jauchem and Cook

(Osler). Here is why you should be personally concerned: the security crew on the merchant vessel had no other weapon but the LRAD—no guns, no swords, no rocks, nothing—just this obnoxious sounding thing that did nothing in the end but get the ship overrun by thugs with grenades and AK-47s.

Now, even though the LRAD and the other devices like it attack the hearing, there is an obvious defense- ear plugs, even Odysseus could have told you that. However, while the Sirens “[cried] / beauty... / [singing] the mind away / on their sweet meadow lolling” (Homer XII 48-54), sonic weaponry is painfully loud and extremely ugly. Ear plugs would be of some help, but can't completely shield the hearing from this onslaught. Further complicating the use of these weapons as acceptable weaponry is the body's built-in defense system, called the 'the aural reflex.' It consists of the clamping down of middle ear muscles, reducing the amplitude of vibration in the inner ear. Because we have this mechanism doesn't mean in any way that our hearing is any safer from sonic weapons. The opposite, in fact. The clamping down of these muscles produces what is known as Temporary Threshold Shift, which just means the hearing is somewhat less sensitive for a while. It's a bit like getting into a drunken bar brawl: you won't notice the pain until the morning, but the damage is the same and maybe even worse because you kept asking for more, so to speak. Repeated exposures to sonic weapons—even very quick exposures—can turn Temporary Threshold Shift into Permanent Threshold Shift. So these devices seem as if they are doing no harm whatsoever outside of being nerve-wracking and temporarily painful. But that's hardly the case. To be sure, sonic weapons, though they are ineffective as military weapons, are not in any way toys or benign devices. They can and do inflict serious damage, even if the person attacked does not immediately realize it (Altmann 18). But before I get into how that all comes together, let me explain a little further why certain kinds of sonic weapons injure people while others don't.

I've already said that attacking the body with sound waves doesn't work. Luckily, the destruction of internal organs using infrasound is a myth, at least as far as the available literature indicates². While being theoretically possible, the energy required to produce enough force is prohibitive. There's a few reasons for this. Sound waves span out like ripples on a pond and are therefore difficult to direct. Since they span out in all directions, energy is

² Altmann 3: “nothing is known about actual weapon use by the military”

lost very quickly. Also, air is a terribly inefficient medium. But let's say that you could direct the sound, as several manufacturers of sonic weapons claim. The amount of force left over once the energy arrives to a location can hardly do anything: the mismatch of resistance between the human body and the surrounding air causes nearly all acoustic energy to be reflected away from the body and into the air.³ To make the journey and overcome this impedance and still have the kind of acoustic energy that could actually do harm to physical objects, you would need enormous amounts of energy. And the device probably would be massive. All this making it difficult to transport and requiring immense amounts of fuel. To really get the job done right, you would basically have to set off an explosion. But if you're going to do that, what's the point of the sonic weapon? Weapons like the flash-bang grenade and Vortex Ring, occasional examples of sonic weapons, are not only incredibly loud, but are explosions complete with smoke, chemicals and a flash of light. That combination would stun the hell out of anyone. And probably render permanent loss of hearing, whatever the special ops teams setting them off wouldn't get around to.

So, the infrasound thing- yes, including "the brown note"- doesn't work. Several different studies have found that if anything of this kind is possible, it's not sound below our threshold of hearing (Mohr et al; Evans; von Gierke and Nixon), but frequencies ranging from 20 - 100 Hz (von Gierke and Nixon; Parker; Ising et al.) at amplitudes of 150 dB and above. The body itself tends to resonate with frequencies, rather than individual organs. And to even get close to that theoretical potential, weapons become extremely unwieldy and indiscriminate (Coupland). And again, you are going to need a huge sound generator and massive amounts of fuel.

In spite of all that is known about acoustics and the failure of any battle-effective design to deliver, the myth of the "brown note" persists. That, of course, is whatever infrasound frequency and intensity that causes uncontrollable bowel movements. Although it may be a little annoying for this topic to crop up from time to time, I argue that it helps to cover the more dangerous attempts at sonic weapon technology, such as those devices intended to suppress the lungs or rupture other internal organs. The effects of the "brown note" are somewhat comical and, above all, not life-threatening. But the same idea moved a little

³ except for the inner ear and the chest cavity

higher in the body is suddenly not nearly as funny. Luckily, no one has gotten it to work yet and probably never will.

Now, to raid someone's hearing is way easier to do and far more effective. This is the part where I start to have big problems with military and police use of these devices. But let's take a step back. Remember that sonic weapons are classified as Non-Lethal Weapons (NLW). Under such a title, the potential harm caused is rhetorically mitigated: the technology has a ring of the progressive ideals of the nations that develop and use them. In other words, we're not shooting you or smashing your shins with billy clubs, we're just playing some annoying sounds at you- what could be so bad about that? Such rhetoric is obvious in the reporting of the success stories of sonic weaponry, where we can always expect at least as much hype as fact. Examples like Norriega being driven out of the Vatican Embassy in 1990 through the use of round the clock heavy metal and that band of cruise ship pirates I mentioned earlier. Very smart, very efficient, very patriotic. But what of the Branch Dividian Complex in Waco in '93, where the FBI blasted Tibetan chant, Christmas music, and the sounds of screaming rabbits, only exacerbating an already desperate situation (Stone)—what about the stuff blared at detainees at Abu Graib, in Afghanistan and Guantanamo (Cusick)—how about New York City cops at the 2005 Republican Convention arming themselves with LRADs (Onion) to pummel any protesters who may've ventured out of their assigned 'free speech zone'? And what happens when this technology falls into the hands of the enemy? If low frequency sound and infrasound ever worked and found their way to the battlefield, that's one thing; these other devices, the ones called 'non-lethal' because they quote, only attack the ears, get a free ride.

I'll end with a comment about the use of music as a particularly nasty reality of sonic weaponry. Perhaps the most popular example would be the helicopter attack scene from *Apocalypse Now*.

[sample]

The use of this music in the film comments on the barbarism and hypocrisy of Western culture. An operatic retelling of a tragic and violent saga penned by an anti-Semitic composer

of the highest genius, his music appropriated by the Nazis, now used to both terrify an Eastern opponent and proclaim superiority: it's a provocative and extremely pressing consideration. The Western audience is forced to ask itself why we would concretize our highest art in order to torture and intimidate.

Suzanne Cusick shares my outrage over the use of music in military operations, writing, however more eloquently, that it “wounds me in that part of my sensibility that remains residually invested in the notion that music is beautiful, even transcendent...a practice whose contemplation would always lead me to contemplation of bodies and pleasures. Not bodies in pain” (2). I couldn't agree more. And I add, whatever science and art can deliver to affect the sublime of the human experience, the military can render despicable.

WORKS CITED

VISUAL / PRINT

- Applied Research Laboratories (The University of Texas at Austin). "Non-Lethal Swimmer Neutralization Study (TECHNICAL DOCUMENT 3138)." 2002.
- Altmann, Jürgen. "Acoustic Weapons—A Prospective Assessment: Sources, Propagation, and Effects of Strong Sound." Cornell University Peace Studies Program Occasional Paper #22. 1999. 5 June 2009 <<http://www.lasernegar.com/SCIENTIFIC/BOOK/OP22.pdf>>
- Blenford, Adam. "Cruise Lines Turn to Sonic Weapon." BBC News. 8 November 2005. 30 June 2009 <<http://news.bbc.co.uk/2/hi/africa/4418748.st>>
- Cusick, Suzanne G. "Music as torture / Music as weapon." Transcultural Music Review. 30 June 2009 <http://www.sibetrans.com/trans/trans10/cusick_eng.htm>
- Coupland, R.M. (ed.). "The SIrUS Project—Towards a Determination of Which Weapons Cause 'Superfluous Injury or Unnecessary Suffering'." Geneva: International Committee of the Red Cross, 1997.
- Jauchem, James R. and Michael C. Cook. "High-Intensity Acoustics for Military Nonlethal Applications: A Lack of Useful Systems." Military Medicine. 172:2 2007.
- Gierke, H.E. von Gierke and C.W. Nixon, "Effects of Intense Infrasound on Man." Infrasound and Low Frequency Vibration. W. Tempest ed. London and New York: Academic Press, 1976.
- Homer. "The Odyssey." Trans. Robert Fitzgerald. New York: Knopf, 1992.
- Monster, Flying Spaghetti & Joshua. "Joshua 6." Bible (Holy). Iron Age.
- Moore, C., J.N. Cole, E. Guild and H.E. Von Gierke. "Effects of Low Frequency and Infrasonic Noise on Man." Aerospace Medicine 36: 9, 1965.
- Onion, Amanda. "RNC to Feature Unusual Forms of Sound: Unusual Forms of Sound to Emanate From RNC." Aug. 25, 2004 . ABC News Science and Technology. 5 June 2009 <<http://abcnews.go.com/Technology/story?id=99472&page=1>>
- Osler, David. "Sonic solution many not be a sound investment." Lloyd's List. 2 December 2008. 1 June 2009 <<http://www.lloydslist.com/ll/news/sonic-solution-may-not-be-a-sound-investment/1228132740372.htm>>
- Phillips, Peter, Lew Brown and Bridget Thornton. "US Electromagnetic Weapons and Human Rights." Media Freedom Foundation, 2006.
- Stone, Alan M.D. "Report and Recommendations Concerning the Handling of Incidents Such As the Branch Davidian Standoff in Waco, Texas." 1993. 30 June 2009 <<http://www.pbs.org/wgbh/pages/frontline/waco/stonerpt.html>>

AUDITORY

- Apocalypse Now. Dir. Francis Ford Coppola. American Zoetrope, 1979.
- "Future Weapons." Discovery Channel. 10 May 2006. 30 June 2009. <<http://www.youtube.com/watch?v=myWxwNQfo-8>>

Other Sources (not used in this podcast)

LRAD

American Technology Corporation: "LRAD Long Range Acoustic Device: The Sound of Force Protection." 2004. 30 June 2009 <http://www.atcsd.com/pdf/LRAD_SellSht-0728-2.pdf >
Hype and spec sheet from the manufacturer.

Associated Press. "Device Fights Enemy With Sounds, Not Swords." YouTube. 30 June 2009
<<http://www.youtube.com/watch?v=y588WH3Q-sQ&feature=fvw> >

"Georgia Police Using the LRAD." RT News. YouTube. 30 June 2009.
<http://www.youtube.com/watch?v=_EUU0BpQego&feature=related >
Police use of batons, fists, kicks, water canons, rubber bullets, tear gas, riot guns, and the LRAD against unarmed people.

"Whale Wars." Discovery Channel. YouTube. 30 June 2009
< <http://animal.discovery.com/videos/whale-wars-lrads.html> >

NORUSCAI. YouTube. 30 June 2009.
<http://www.youtube.com/watch?v=k7r-V6rDOPa&feature=channel_page >.
Background and Somalia Pirate incident (advertisement / non sequitur-style).

Sella, Marshall. "The Sound of Things to Come." New York Times Magazine. March 23, 2003. 7 June 2009 <<http://www.nytimes.com/2003/03/23/magazine/23SOUND.html?pagewanted=1>>
About inventor of the LRAD and HyperSonic Sound (as well as many other devices), Woody Norris. Very interesting read, however flattering the writing may be towards the subject.

Wilson, Tracy V. How LRAD Works. How Stuff Works. 30 June 2009 < <http://science.howstuffworks.com/lrad.htm>>
An easy-to-understand / read article on acoustics and the workings of the LRAD.

General

"Acoustic Blaster LIC 2004." Defense Update: International Online Defense Magazine. 30 June 2009
<<http://www.defense-update.com/events/2004/summary/LIC041-hs-nlw.htm>>

"Acoustic Weapons in Nature." BBC. YouTube. 30 June 2009
<<http://www.youtube.com/watch?v=L8wMXXaMHKs&feature=related> >

Alexander, John B. Future War: Non-Lethal Weapons in Twenty-First Century Warfare. New York: St. Martin's Press, 1999.

Associated Press. "The Scream: New IDF Weapon Designed to Leave Victims Dizzy, Nauseous, Could Be Used on Gaza Settlers." Israel News. 10 June 2005. 30 June 2009
<<http://www.ynetnews.com/articles/0,7340,L-3097486,00.html> >

Grossman, Lev. "Beyond the Rubber Bullet." Time Magazine. July 21, 2002.

Lewer, Nick. "Research Report 2." Bradford Non-Lethal Weapons Research Project (BNLWRP). 1998. 30 June 2009 <http://www.brad.ac.uk/acad/nlw/research_reports/researchreport2.php>

Moore, Harry Jr. "NDIA: Non-Lethal Defense IV, 'Aversive Audible Acoustic Devices.'" Army ARDEC.

“No Longer Science Fiction: Less Than Lethal and Directed Energy Weapons.”

Defense Update: International Online Defense Magazine, November 2006.

30 June 2009 <<http://www.defense-update.com/features/du-1-05/NLW-DEW.htm>>

Rappert, Brian. Non-Lethal Weapons as Legitimizing Forces? Florence, Kentucky: Routledge Taylor & Francis Group, 2003. 200X. 30 June 2009 <<http://books.google.com/books?id=7aySLt6WETsC&pg=PP1&dq=Non-lethal+Weapons+as+Legitimizing+Forces%3F>>