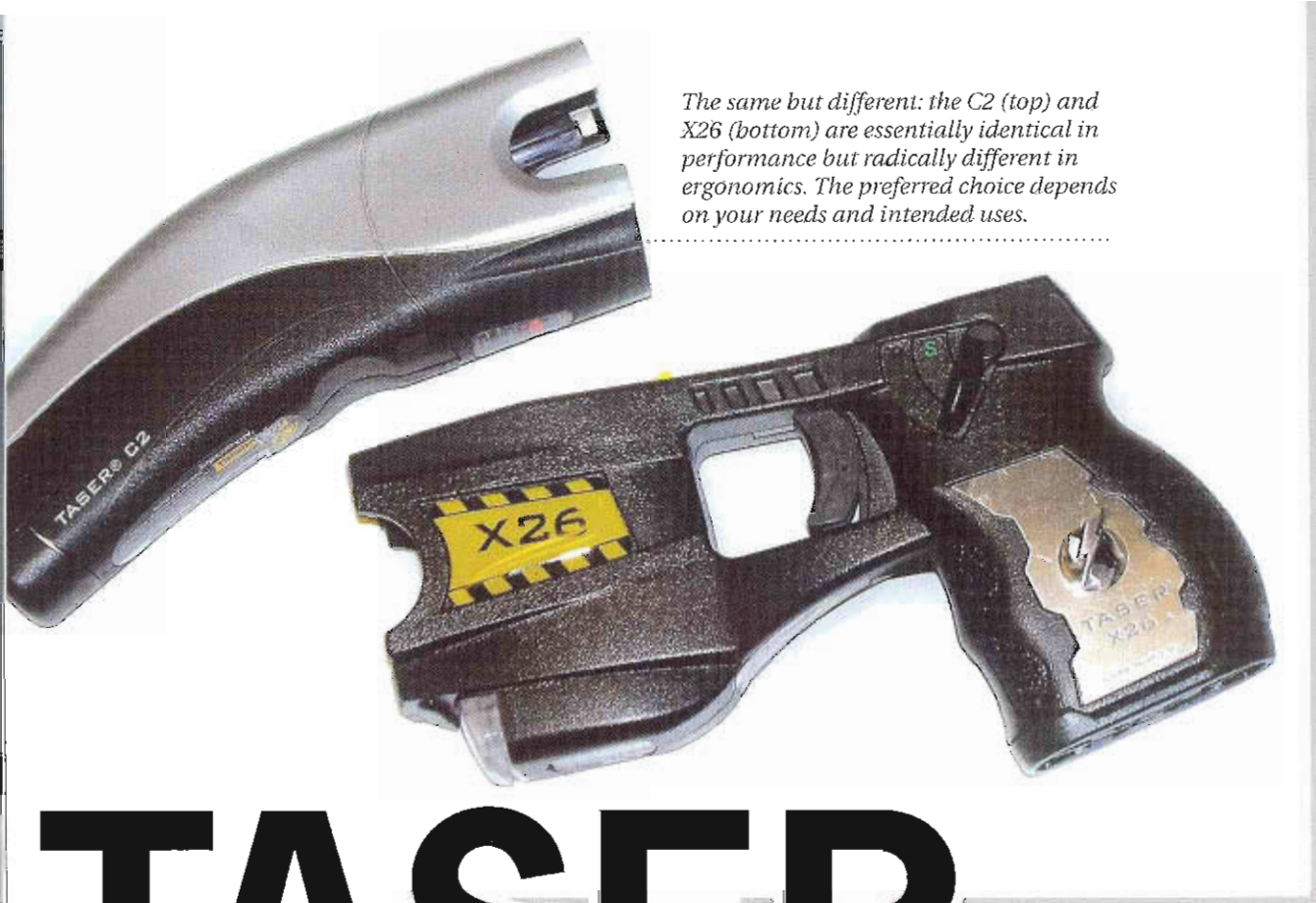

The same but different: the C2 (top) and X26 (bottom) are essentially identical in performance but radically different in ergonomics. The preferred choice depends on your needs and intended uses.

TASER TECHNOL

[BY TIM THORSTENSON]

This article will examine some technical details about how Tasers work so you can make a better-informed decision about whether a Taser may fit into your own defensive plans.

Any "alternative" weapon can be a double-edged sword when used in conjunction with a handgun. Having an extra tool can give you an option in cases where deadly force may be questionable or inappropriate, and it may serve to defuse a situation before it escalates to the point of requiring deadly force. But having multiple options can also complicate the defensive response and produce a dangerous hesitation in a moment of need. In addition, the required amount of training and mental preparation increases exponentially with the number of available tools.

HOW DOES IT WORK?

It's easy to carry on a conversation with a friend across the room, but if someone turns on a vacuum cleaner, communication becomes more difficult-though not impossible, because you can shout over the noise. However, if someone starts jack-hammering concrete in the room, verbal communication is no longer possible, because the noise has become too loud to shout over. The Taser does the same thing to the central nervous system that the jackhammer does to spoken communication: the electrical impulses from the Taser are strong enough to effectively "drown out" the signals the brain sends to the muscles to make them work. The person being zapped essentially loses control of his or her muscles and typically drops to the ground. Taser literature refers to this as *Neuro-Muscular Incapacitation* (NMI).

If you were trying to come up with a noisemaker that would keep people from being able to communicate across a room, the challenge would be to make something too loud for people to shout over, but not so loud as to cause permanent hearing damage. The same basic problem is at work with the Taser: the goal is to produce an electrical signal powerful enough to disrupt the signals from the brain, but not so powerful as to cause any lasting damage to the brain or body. By tweaking voltage, current, and pulse duration, Taser International allowed the electrical pulses delivered by its units to become potent enough to "out-shout" the brain while still remaining weak enough to prevent any permanent damage.

RESISTING THE TASER

Early Tasers (the original product was called the "Air Taser") suffered an occa-

The Defensive "Burden": Proper defensive preparedness means carrying a lot of stuff in addition to your handgun. Spare ammo, a tactical light, and a cell phone are widely recognized essentials. A decent knife, a backup light and even a backup handgun are often suggested, too. Fitting a "force option" like a Taser into the mix requires careful consideration.

OGY

sional failure to incapacitate a person. On rare occasions, a really wigged out individual could be Tasered and still continue to function. As a result, the company refined the electrical shock delivered by their products. Current Taser products boast very high ratings of effectiveness, but there are still rare reports of the devices not successfully disabling the suspect. The "fog of battle" may be operative here, as in these cases there is always the question of whether solid contact with the target was actually made. Nonetheless, there have been a few demonstrations of highly trained individuals being able to fight through a full-powered and well-placed Taser shot in a controlled environment. Based on this, it is reasonable to suspect that a small fraction of the populace could fight through the Taser's effects during real life violent encounters.

Now, this little tidbit does suggest an interesting concept for a new reality show ("Who Wants to Beat the Taser?"), but I do not think it should be seen as a big negative against the devices. The pages of history contain many stories of people who have been able to "fight through" pepper spray, batons, and even well-placed bullets from major-caliber handguns, at least for long enough to cause additional mayhem. The fact that the occasional individual may be able to fight through the jolt of the Taser simply establishes that the Taser is in the same category as every other defensive weapon ever invented: it is not 100 percent effective. As a practical matter, the limitations addressed in the "Taser Tactics" article are probably far bigger concerns. It may be less melodramatic than fighting through the effects of a successful hit, but a meathead armed with an empty pizza box is just as capable of defeating a Taser by simply blocking the probes *before* they hit home.

STUN GUNS

The approach used by the Taser is in marked contrast to traditional "stun guns." Such devices generally use simple circuitry to send a very high voltage to a pair of probes mounted on the unit. The raw voltages generated by both stun guns and Tasers would be lethal except that the circuitry of the devices restricts the total amount of electricity (the electrical current) that is delivered.

The most obvious difference between a Taser and the traditional stun gun is that the Taser will work at a distance while a stun gun must be held against an aggressor at contact distance. But the other difference-which is just as important-is that the shock delivered by the Taser comes in the form of a repeating pulse that is specifically tailored to override the normal nerve signals sent by the brain. This is what gives the Taser a very high probability of temporarily shutting down an assail-

Taser is seeking the "mass consumer market" (can you tell?) and this can make the serious defender wonder a bit about the products. But the C2's incapacitation effect is comparable to Taser's law enforcement products.

ant when a solid hit is scored with the probes. Stun guns cause pain and other effects but, because they do not overwhelm the nervous system, they can easily be defeated by a motivated assailant. Further, the unit must be held in contact with a grappling, struggling, and angry individual. Many legitimate experts strongly discourage the use of such devices for civilian self-defense, and folks like Massad Ayoob and Gila Hayes have repeatedly demonstrated ways to defeat conventional stun guns.

DIFFERENCES BETWEEN TASER PRODUCTS

For simplicity, we have so far used "Taser" as a rather generic term. But Taser has four main models: the M26, the M18, the X26 and the C2. The "M"-series products deliver 0.50 joules per pulse, while the X-series and C2 models deliver a lower, but still effective 0.07 joules per pulse. The joule is a unit of electrical energy and this difference would certainly seem to imply that the M-series products deliver a much more potent jolt. But here's the rest of the story: The higher-energy M-series products are actually an earlier design. The M-series is very effective, but these products require a large amount of total power to get the job done, so a power plant of eight AA-sized batteries is needed. If you pick up eight AA batteries in your hand and then imagine trying to pack them into a pistol-shaped Taser, you get an appreciation for the size limitations imposed by these power requirements.

With the newer models, Taser tuned the electrical pulse to correspond even more closely to the electrical signals used by the human nervous system. The result is equally effective incapacitation with a lower energy demand, which results in a practical benefit of a smaller, more compact package. The newer X26 and C2 units operate from a pair of the same small, light-weight lithium 123A batteries commonly used in tactical flashlights.

Power demands: the older M-series Tasers were quite effective, but they were also power hungry and required eight AA batteries. The newer X26 and C2 are equally effective but use much less power. As a result, they can be run on a pair of lightweight and compact lithium batteries.

Of course, theoretical effectiveness is one thing, and a smaller package is great, but actual field performance is the important measure. After all, no legitimate defensive expert suggests carrying a .25 auto simply because it is smaller. Fortunately, the vast majority of Tasers sold to law enforcement in the last few years have been the newer, more compact X26 version, so a big body of field data is available to show that the X26 is every bit as effective as the M-series products in actual use.

CIVILIAN AND LAW ENFORCEMENT TASERS

All Taser products available to civilians are limited to a range of 15 feet, while law enforcement units have ranges up to 35 feet. The civilian models also deliver fewer pulses per second than the law enforcement equivalents, at least for part of their cycle. For instance, the law enforcement version of the X26 (the X26E) delivers 19 pulses per second, while the civilian X26C delivers 17 pulses per second for the first two seconds and then drops down to 10 pulses per second. The ergonomic C2 starts out at 19 pulses per second for the first five seconds (same as the law enforcement X26), but then varies through a slower pattern, a faster one and then a slower one again over the rest of its discharge cycle. The energy delivered by *each* pulse is the same 0.07 joules for both law enforcement and civilian products.

The simple and practical reason for this difference has to do with intended use. In a law enforcement application, the usual post-Taser response is for officers to immediately throw down on the suspect and restrain him. In contrast,

the goal in civilian use is to drop the bad guy long enough to allow the defender to get away. These different goals mean a longer total firing time is appropriate for the civilian units. The law enforcement X26E fires a five second cycle. But the new C2 model runs a thirty second cycle. The longer discharge cycle of the civilian units demands more energy, so the number of pulses per second was modified to insure that the battery packs could keep up with the demand.

Whether it is the effectiveness of a product like the Taser, or the reliability of defensive ammunition, or the lumen rating of a tactical flashlight, or the hotness claimed by a pepper spray manufacturer, consumers must realistically assess the trust placed in the folks who make the products. Taser International confidently states that the modifications made to allow longer firing times for the civilian products do not reduce effectiveness. The company has been around for a while, its products have been subjected to a lot of scrutiny, and they boast an extremely solid track record for effectiveness. It's worth noting that, for the first five seconds, the jolt delivered by the civilian C2 is absolutely identical to that of the law enforcement X26E (which has a very well documented track record). But after the five seconds, the law enforcement model *stops* (unless it is manually reactivated) while the C2 continues to fire a restraining pulse for another 25 seconds.

The Taser is a legitimate tool that definitely has a role both in civilian self-defense and in law enforcement. Whether it has a role to play for you and your defense plans is your final call to make. But I hope that a little plain-spoken background on how the things work, and the pros and cons that this creates, will help you make a better-informed decision if you are considering the Taser for yourself or for loved ones. ■

Tim Thorstenson is a chemist by education. His goal is to inform readers of the scientific aspects of self-defense to allow a better-informed evaluation of the available tools and information. Contact him at timthorstenson@yahoo.com.