

By Al Paulson and N.R. Parker

Military Armament Corporation production-model WerBell silencer featuring both spiral diffusers and frusto-conical baffles, mounted on an early Colt select-fire AR-15. *Al Paulson photo.*

HEL 5.56mm Suppressors for the M16A1

The growing involvement of U.S. armed forces in Vietnam stimulated the deployment of the new rifle developed by the late Gene Stoner and his colleagues at ArmaLite as the AR-15, and produced under license at Colt as the M16 once adopted by the U.S. military. SpecOps personnel soon recognized the value of suppressed weapons in general, and suppressors for the little black rifle in particular. The U.S. Army's Human Engineering Laboratory (HEL) at Aberdeen Proving Ground developed a number of suppressors for the M16 rifle from the early 1960s onward.

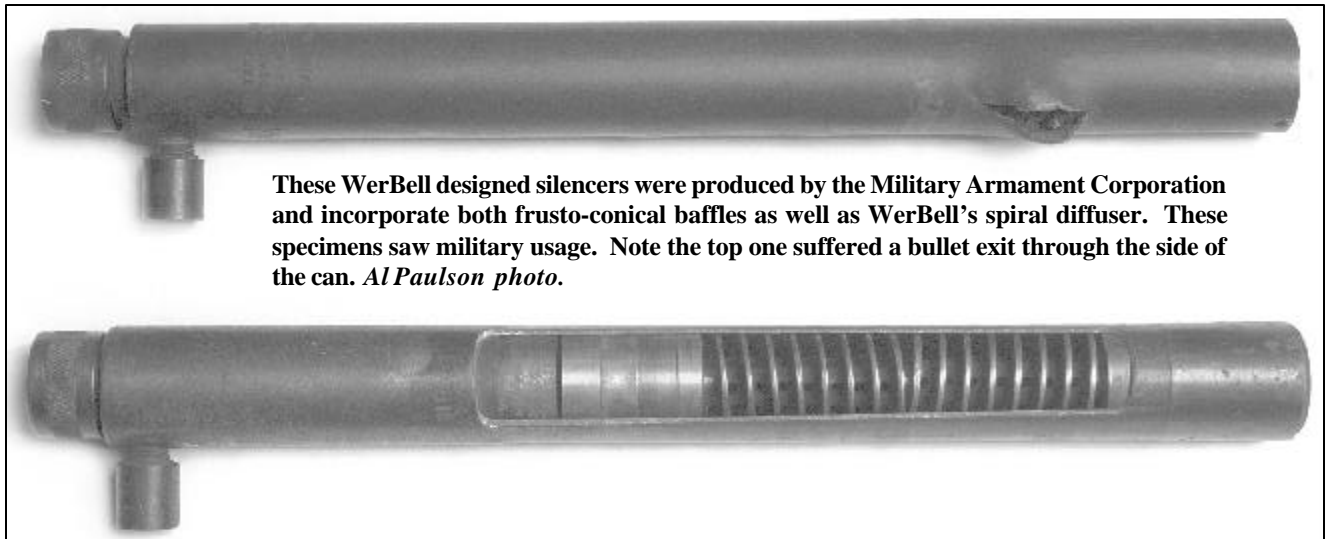
The HEL M2 was an experimental M16 suppressor that used a series of baffles coupled with an expansion chamber extending back over the barrel to the front sight. The M2 model

for the M16 rifle was 14 inches long and used 24 baffles forward of the muzzle. Following an ENSURE (Expediting Non-Standard Urgent Requirement for Equipment) request (DA ENSURE Index No. 77) from the USARV (United States Army, Vietnam) for silencers for the M16A1 rifle in May 1966, HEL designed and tested a noise suppressor designated the HEL M4, which was a variant of the M2.

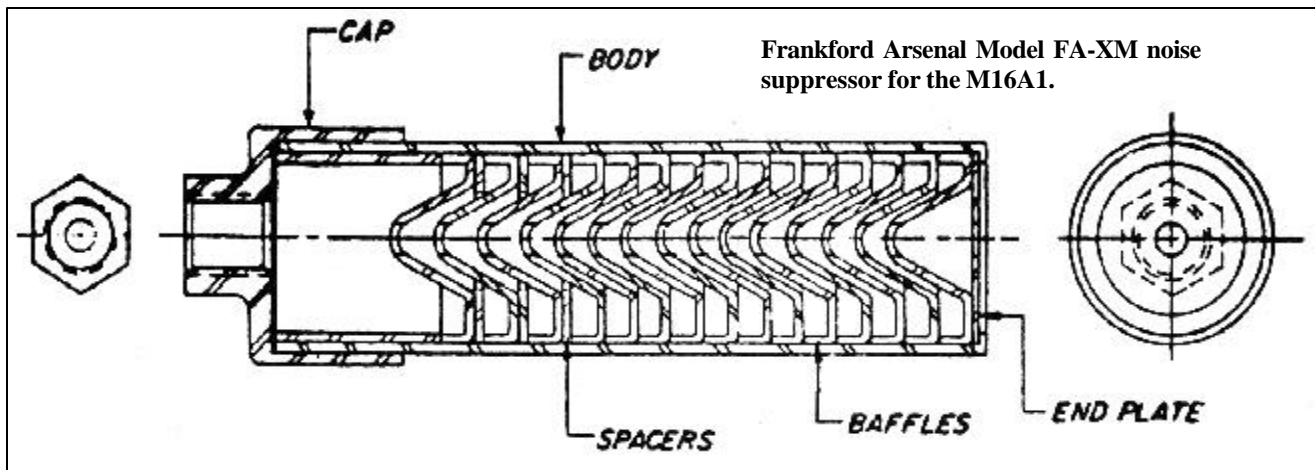
To reduce the bulk and weight of the M2 5.56mm suppressor, HEL shortened the length to 12 inches, reduced the number of baffles, and changed the internal arrangement of components. The number of baffles was reduced from 24 to 11, with the first baffle being positioned backwards (i.e., so that its apex was toward the front of the suppressor). Directly in

front of this baffle was a short expansion chamber followed by a baffle positioned normally (i.e., with its apex toward the muzzle of the rifle). This baffle had a very large bullet passage, presumably to reduce back pressure. The next 9 baffles were the same design as the first baffle, but were oriented normally.

The new can eliminated enough of the muzzle blast so that the location of the shooter was undetectable to hostiles downrange, which greatly improved a shooter's tactical advantage and survivability. Given ideal vegetation and terrain, the muzzle blast from an M16A1 was completely indistinguishable beyond 50 yards. Only the sonic boom created by the 5.56mm projectile remained, which sounds something like the report of a short-



These WerBell designed silencers were produced by the Military Armament Corporation and incorporate both frusto-conical baffles as well as WerBell's spiral diffuser. These specimens saw military usage. Note the top one suffered a bullet exit through the side of the can. *Al Paulson photo.*



Frankford Arsenal Model FA-XM noise suppressor for the M16A1.

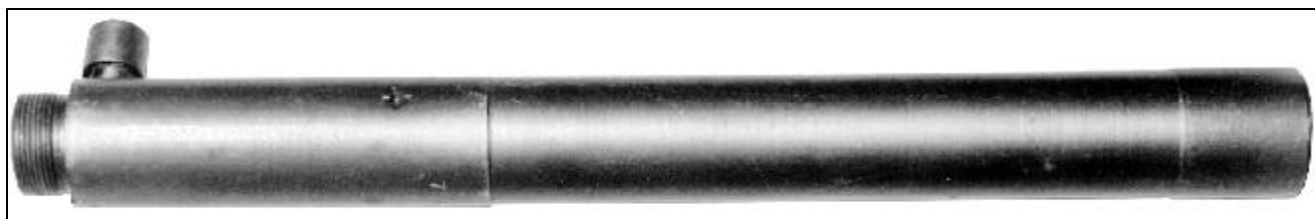
barreled .22 rifle. In the absence of a muzzle blast, the mammalian brain interprets the origin of the gunshot as perpendicular to the pressure wave of the ballistic crack striking the body. Combined with the sound of bullet impact, this phenomenon causes individuals to turn their attention 90 to 180 degrees away from the shooter. This is a

USARV. Twenty suppressors were sent to USARV for testing.

In March and April 1968, the USAIB (United States Army Infantry Board) tested the M4. The USAIB test found that the M4 had three shortcomings. (1) The gas deflector failed to deflect all of the escaping gases from the firer's eyes. (2) The ejection pattern of

to HEL for correction of these shortcomings.

Early development at Aberdeen also demonstrated that the M4 generated a number of problems with the M16A1 rifle: (1) increased back pressure; (2) increased cyclic rate; (3) increased rearward bolt velocity, and (4) excessive gas discharge from the ejec-



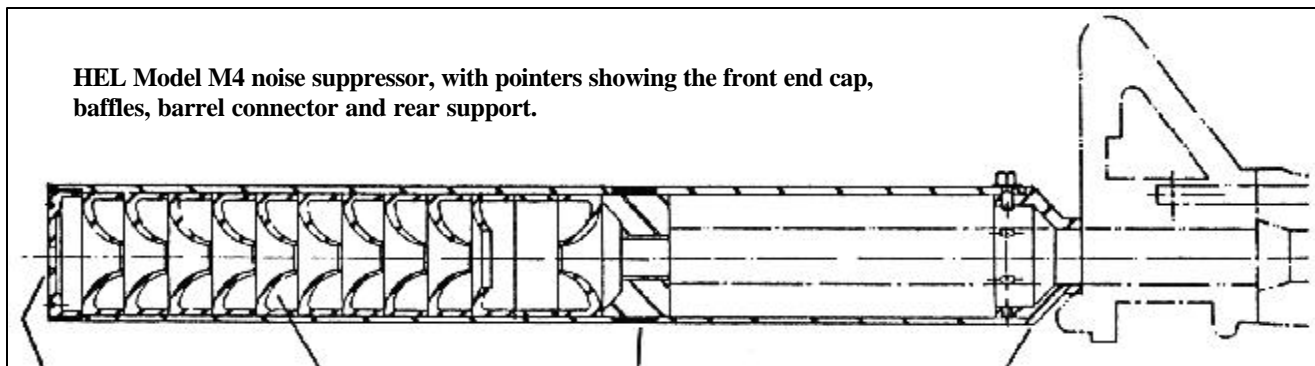
Early SIONICS MAW-556 rifle suppressor with two-diameter suppressor tube and pressure relief valve. Reprinted with permission from Volume 2 of *Silencer History and Performance*.

very good thing during an ambush or when a small force equipped with silencers must cope with a larger force.

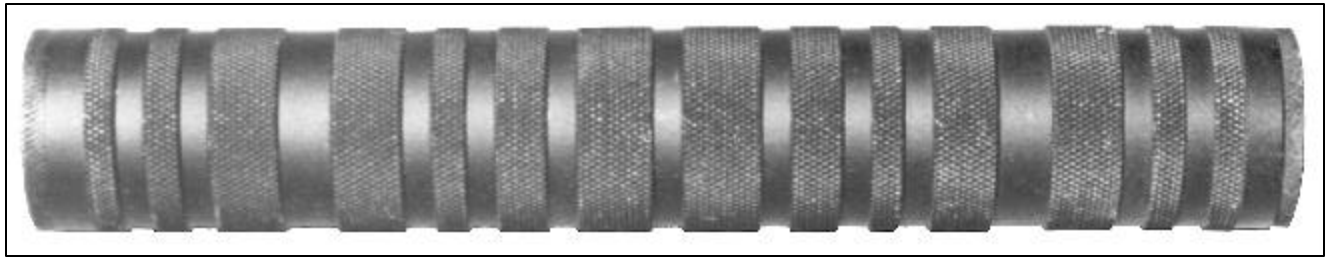
To meet the ENSURE #77 requirement, the USARV submitted an acquisition requirement for 1,080 HEL M4 noise suppressors. By December 1967, the first 120 suppressors had been produced, but further production was suspended pending a field evaluation by

the rifle with noise suppressor attached caused the spent cartridge case to strike the cheek of left-handed shooters. And (3) the malfunction rate of the test rifle was significantly higher than the control rifle during automatic fire. The USAB concluded that the HEL M4 sound suppressor had military potential but it was not the perfect tool for the job, so the Board returned the M4

tion port into the shooter's face. The major problem was the increased back pressure, which actually produced the other problems, such as shearing off the bolt carrier key. HEL solved the bolt velocity and cyclic rate problems by adding an additional gas pressure relief port to the bolt carrier, which enabled reliable functioning of the rifle whether the selector was set to SEMI



HEL Model M4 noise suppressor, with pointers showing the front end cap, baffles, barrel connector and rear support.



Extremely early SIONICS M16 suppressor featuring five spiral diffusers and no baffles or pressure relief valve. This design was patented in 1968 (Patent 3,500,958) and again in 1972 (Patent 3,667,570). Reprinted with permission from Volume 2 of *Silencer History and Performance*.

or AUTO.

The only glitch with this solution was that the rifle would not cycle reliably with the modified bolt carrier unless the suppressor was installed. This meant that a rifle fitted with the modified bolt carrier had to be dedicated for suppressed use only.

Once installed, the suppressor became an integral part of the rifle that

eliminated the need for a specially modified bolt carrier. Apart from the removal of 5 baffles from the baffle stack, the new suppressor used the same arrangement forward of the muzzle of the rifle. This new 9.5 inch model was known variously as the HEL M4A, or H4A, or E4A which was its final designation. The gas deflector was also intended to be used with the

noise suppressors for testing to meet the ENSURE #77 requirement. The Frankford Arsenal silencers were 1.25 inches in diameter and utilized porous aluminum rather than baffle technology. These very early SIONICS silencers used WerBell's spiral diffusers, but did not incorporate baffles that would later be seen in his patents and production units. They also featured a flash



HEL E4A noise suppressor on M16A1 rifle. Ian D. Skennerton photo. Reprinted with permission from Vol.2, *Silencer History and Performance*.

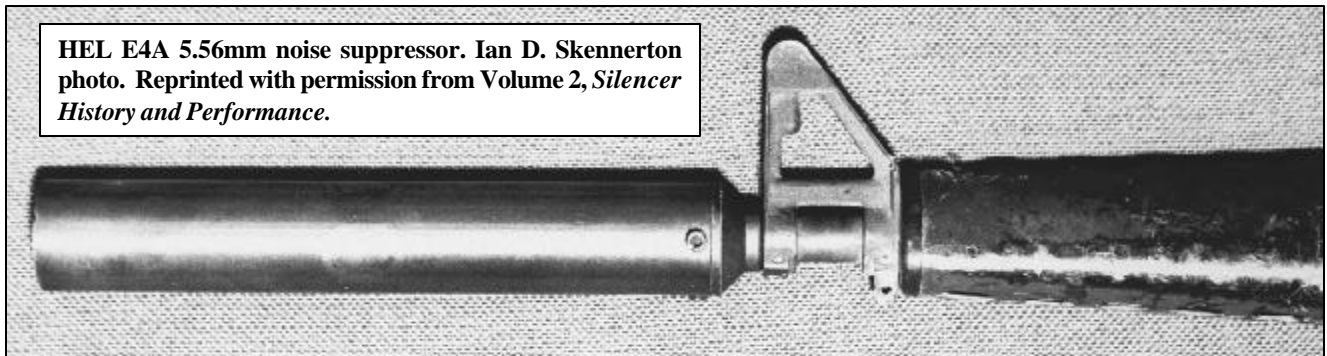
could not be removed without swapping the bolt carrier as well. This was not an ideal situation for special operators. Furthermore, the suppressed rifle with modified bolt carrier still dumped a lot of hot combustion gas into the shooter's face, so HEL added a special gas deflector to the charging handle of the M16A1 rifle. This deflector was not entirely successful, however.

In April and May 1968, HEL developed a new, shorter suppressor that

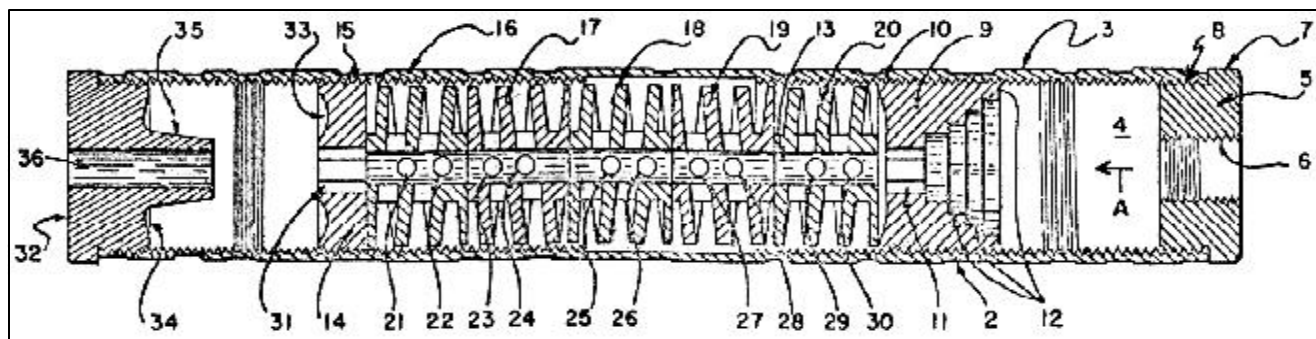
new suppressor, but there is little evidence to suggest that it was actually used with the E4A suppressors in the field.

Other developers of noise suppressors tried to meet the ENSURE #77 requirement, including SIONICS (a commercial company that eventually merged with the Military Armament Corporation) and Frankford Arsenal (FA; which was a government facility). In May 1968, HEL, SIONICS and FA submitted a total of seven different

hider that screwed onto the front end cap of the SIONICS silencer. The HEL M4 and M4A suppressors were tested at Ft. Benning, Georgia, by the USAIB in a Military Potential Test (MPT) against the FA (Frankford Arsenal) FA XM and CM noise suppressors and three different versions of the SIONICS 5.56mm suppressor (the MAW-A1, A2, and A3 models). The test recommendation was that the HEL E4A noise suppressor was suitable for a field evaluation in Vietnam.



HEL E4A 5.56mm noise suppressor. Ian D. Skennerton photo. Reprinted with permission from Volume 2, *Silencer History and Performance*.



Inside look at an early knurled SIONICS 5.56mm silencer for the M16A1 rifle which features five of WerBell's spiral diffusers but no baffles or pressure relief valve.

The HEL E4A was win-win technology. While it was not as quiet as the M4, it solved all of the reliability and durability issues plaguing the M4 suppressor. Furthermore, it was more compact than the HEL M4. While the E4A did not require a modified bolt carrier (unlike its M4 predecessor), we find it quite interesting that the E4A was considered to be a permanent fixture once it was fitted to a rifle.

The E4A produced a net sound reduction of 26 dB (at 12.5 feet down range and 2 feet to the right of bullet trajectory). That was significantly better than the SIONICS suppressors (by about 10-11 dB), but not as good as the HEL M4 (which produced 35-36 dB reduction) or the FA XM (which produced 32-36 dB reduction). See the accompanying sidebar to learn more about the sound level measurement procedures used for these HEL tests. All of the other five suppressors tested by the USAIB had shortcomings. The performance of the E4A out-shone the other suppressors, especially with regard to the number of malfunctions that occurred during cyclic tests. The malfunction rate of the E4A was significantly lower than all other suppressors tested; during a 1,000-round cyclic rate test, only 3 malfunctions occurred with the E4A.

While some shortcomings were noted with the SIONICS suppressors, SIONICS was well advanced in the use of high-tech materials compared to the other suppressor manufacturers of the time. SIONICS used a plastic bushing under the rear retaining collar. Unfortunately, this bushing melted during a full-auto testing. A redesigned bushing made from Teflon was then submitted during the MPT to rectify this problem. Unfortunately, Teflon melted when temperatures reached about

1,000 degrees F, so SIONICS finally settled upon making the bushings from naval bronze.

Another problem was the gas pressure relief valve. The springs used in the relief valve failed during the cyclic rate testing, so a redesigned spring made from Inconel was submitted in an attempt to rectify this problem. Even resorting to using a high-temperature resistant alloy like Inconel proved unsuccessful, so SIONICS developed its third and final design: a passive gas pressure relief valve with no moving parts. Significantly, the MPT found that the pressure relief valve had no effect on the operation of the test items, and concluded that it was an unnecessary part of the suppressor. It is also interesting to note that use of a gas pressure relief valve with center-fire rifle suppressors has not been seen since its use in the SIONICS suppressors, with one exception. Recently deployed Israeli-made centerfire rifle suppressors for the M16A1 and M14 rifles have featured the use of gas pressure relief valves, despite the fact that advances in internal design have clearly eliminated any need for pressure relief valves.

Two of the SIONICS suppressors used titanium spiral suppressor rings, while the third used aluminum spiral suppressor rings. Following further destruct tests at Ft. Benning, SIONICS made significant changes to the construction and materials used in the 5.56mm suppressors. No internal parts were subsequently made from aluminum, and stainless steel became the material of choice. While the use of titanium has become more widespread in recent years, it is a little-known fact that SIONICS pioneered the usage of titanium in firearms sound suppressors, though undoubtedly the cost factor pre-

vented its widespread use during the Vietnam years. Despite the advances in material use, the SIONICS/Military Armament Corporation's suppressors were not as widely used as the HEL E4A in Vietnam.

After the MPT report was published in September 1968, final production of the outstanding 960 HEL E4A suppressors was completed, and these were shipped to Vietnam in late 1968 and early 1969 at a cost of \$42,000. That works out to less than \$46 per unit. According to several sources, the HEL E4A suppressor was used in greater numbers during the Vietnam War than SIONICS/Military Armament Corporation's suppressors designed for the M16A1 and CAR-15. Rangers, SEALs and Army Special Forces began using HEL M4 silencers in the summer of 1968 and then upgraded to the HEL E4A suppressors, which were employed throughout the remainder of the Vietnam War. The SEALs, however, eventually used a U.S. Navy-developed 5.56mm suppressor rather than the E4A suppressor.

Surprisingly, both the HEL M4 and E4A suppressors were considered to be expendable items. If they were damaged, they were to be destroyed by the company armorer rather than repaired. This may explain why the HEL M4 and E4A suppressors are rarely seen today in collectors' hands. It is known that during the early 1980s, at least one mail-order company was selling parts kits for the M4, although this practice ceased when ATF changed the definition of a silencer to include silencer parts. If you ever find a transferable M4 silencer, it's a rare and important historical artifact from the Vietnam War.



Industry News
Continued from page 9

The ruling upholds a December 2000 decision by U.S. District judge Berle M. Schiller of the Eastern District of Pennsylvania.

Trying a different approach, Gun Industry Watch, a project of the anti-gun group, Alliance for Justice, has asked the Federal Trade Commission (FTC) to expand its probe of biological weapons' websites to include firearms.

At the beginning of the year, the FTC sent e-mails to a number of websites claiming to offer protection from biological and nuclear agents and warned them that it is illegal to make false claims about the health and safety offered by their products. The Gun Industry Watch letter claimed that gun manufacturers should be held to the same standards.

To justify her request, Alliance for Justice president Nam Aron, cited typical anti-gun biased studies in her letter to the FTC's director of consumer protection, Howard Beales. "By these standards, gun manufacturers and retailers are in violation of the law any time they claim that the purchase of firearms will help protect consumers. Scientific data indicates that a gun in the home is 22 times more likely to be used in a suicide, accidental shooting, or homicide, than in self-defense," Aron wrote.

**Restrictions Reported On
.50 Cal Rifle Exports**

The Violence Policy Center says it has been successful in influencing the U.S. Department of State to restrict the export of .50 caliber rifles for sale to civilians abroad. The anti-gun group says it has been working "closely" with Reps. Henry Waxman (D-CA) and Rod Blagojevich (D-IL), along with Sen. Dianne Feinstein (D-CA) to get a variety of restrictions placed on such rifles.

Rep. Waxman recently sent a letter to U.S. Secretary of State Colin Powell commending Powell on his willingness to "offend the gun lobby."

The letter notes representatives of the State Dept.'s Office of Defense Trade Controls met with Waxman's staff and notified them that the Department has suspended indefinitely further approval of applications to export .50 caliber rifles to foreign individuals or commercial resellers in foreign countries in light of the September 11th incidents.

Waxman's letter went on to note that applications to export seventy-five .50 cal. rifles were approved for export to foreign dealers in 2001. Prior to the decision to suspend, 16 had been shipped. The State Dept. later suspended the export of the remaining 59

rifles.

Banning Youth Guns

Flush with an apparent victory in influencing the imposition of export restrictions on .50 caliber rifles, the Violence Policy Center has issued a 21-page report, "A .22 for Christmas, How the Gun Industry Designs and Markets Firearms for Children and Youth."

"The gun industry promises that a gun in a child's hand is a shortcut to responsibility and maturity. In fact, the only guarantee is one of increased risk of death and injury," states Martin Langley, a VPC policy analyst and the



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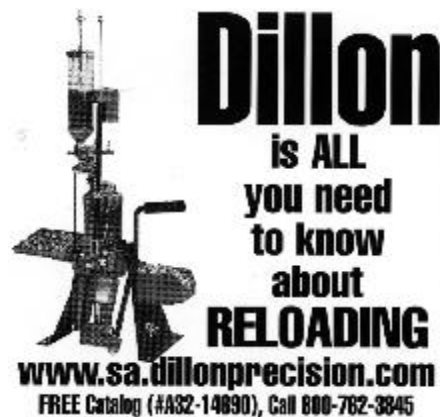
study's author. "The firearms industry is attempting to secure their own survival by endangering that of our children."

Taking offense at statements such as that appearing in the August 2001 issue of *Handguns* magazine that, "Children are our salvation in the fight for liberty and the preservation of the shooting sports," the report complains of the marketing of "an increasing number" of youth model firearms.

As "evidence" of the industry's campaign to attract children to the "gun culture," the VPC reports mentions firearms advertising in youth magazines such as *Boy's Life* and the NRA's publication of *Insights* magazine which is edited for the younger set; the Eddie Eagle program which the study's author calls a "marketing tool disguised as a safety program; using video games to put virtual guns in the hands of potential customers; and using public school wildlife management lessons to develop interest in hunting and firearms.

The report further complains of firearms manufacturers' "open acknowledgement of their cultivation of the youth market." To back this up it uses quotes such as that of Chris Johnson, vp, Rogue Rifle Company, producer of a diminutive single shot .22 caliber rifle: "It's (the Chipmunk bolt-action rifle) a great father/son, father/daughter rifle because children can't cock the rifle by themselves until they're seven or eight years old...Christmas is important, but don't forget about birthdays. Rimfires make great gifts all year long."

The report also quotes from an "I'm the NRA" ad



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featuring pro-gun actor Tom Selleck which promised, "Shooting teaches young people good things. Because all good rules for shooting are good rules for life." To counter this, the VPC report mentions several instances of youths shooting others or getting into hunting accidents. It also mentions the risk to youth of lead poisoning it says shooting ranges pose.

In conclusion, the report calls for federal law to be modified to make it illegal for anyone under the age of 18 to possess a long gun and for anyone under 21 to possess a handgun, apparently under any circumstances. The report ends with a list of 40 youth model firearms produced by 20 manufacturers "To show the scope of the effort by the industry to market firearms to children."

Extreme Shock Ammo

Among the most innovative new products to hit the market recently is Extreme Shock Ammunition. The lead-free NyTrillium composite product, is called "The world's premier anti-terrorist round."

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pieces within soft tissue as some other rounds are known to do, reducing the risks to EMS personnel. The expended projectile is typically contained within soft tissue targets. The round disintegrates when it hits hard targets, such as the interior walls of a dwelling and airplane skins.

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The Los Angeles Police Dept. has selected TASER Int'l's ADVANCED TASER M26 to replace older Tasertron units. Some 500 units were ordered, to replace 250 of the older devices. The total expenditure is about \$225,000. The units transmit electrical impulses that temporarily disrupt the body's central nervous system.

"The LAPD was one of the most significant users of earlier generation TASER technology, and probably has more field experience with it than any other U.S. department," commented Rick Smith, TASER's CEO. "Their selection of our product as a less-lethal weapon platform should further accelerate the adoption by other agencies. The advanced model is nearly four times more powerful than LAPD's previously used TASER's. The M26 has built-in laser sights and an onboard data chip to record the time and date of each firing to backup officers' use-of-force reports.

In other news, quality handgun manufacturer Kahr Arms has made the approximately \$20,000 commitment needed to join the Sporting arms & Ammunition Manufacturers Institute (SAAMI). Counting Kahr, SAAMI's membership now totals 23 producers of firearms, ammunition and propellants. SAAMI's mission is to establish manufacturing standards for small arms and ammunition.


The 2001 firearms and ammunition excise tax total dropped to \$175,959,000 in Fiscal Year 2001 from Fiscal Year

2000's total of \$197,840,000, according to the Bureau of Alcohol, Tobacco & Firearms.

Kathleen Townsend Kennedy, Maryland's lieutenant governor, has given the nod for the launch of Project HomeSafe, the firearms safety effort, to begin in her state. The program will

be run in cooperation with police and sheriff's departments that will hand out free firearms safety kits including a cable-style gun lock and safety brochure. Project HomeSafe will schedule its "safety tour" truck to make stops around the state to provide safety education at the community level.





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