Caseless Ammunition:

The Future is Now

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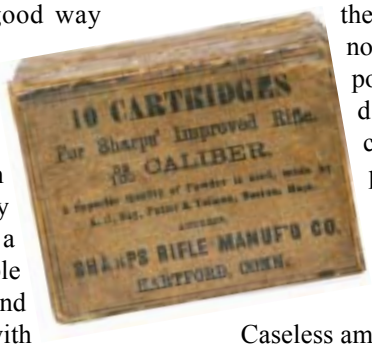
The subject of ammunition is always good way to get a discussion started, and any technological advance that proposes to radically change the way we do business will attract attention. With that in mind, let's look at the subject of caseless ammunition, an idea that has been around in one form or another for at least a century and a half. The American Civil War saw a proliferation of attempts at developing combustible cartridges that were self-contained, could withstand handling, and which presented minimal problems with bore fouling. The powder charge and bullet were enclosed in either paper, linen, a covering processed from animal intestines, or other material that could be easily wrapped and folded. These rounds were usually unprimed, and were fired by a percussion cap once chambered. Figure 1 shows a number of Civil War rounds that illustrate different techniques of manufacture. Although innovative for their time, they were not without their limitations: nitrated paper, while rigid and easily handled, tended to absorb moisture from the air which both compromised the strength of the paper and affected the burn rate of the black powder propellant. Shellac offered better protection from moisture, and hence was also used. The .52 caliber Spencer copper-cased cartridge is shown only to illustrate the transition between combustible cartridges and the fixed ammunition in use today.



Rounds of today's caseless small arms ammunition differ from the small arms ammo we all know, in that there is no primed brass or steel cartridge case to hold the powder and bullet. Caseless rounds currently under development and testing instead consist of a cylinder of solid propellent that holds the projectile and primer and which leaves no fired case requiring extraction and ejection. Figure 2 represents a schematic diagram of a typical caseless round as envisioned by the German firearms manufacturer Heckler & Koch (H&K).

Caseless ammunition can be a great deal lighter and cheaper than conventional rounds, because the heaviest — and most expensive — component of present ammunition is the brass or steel cartridge case. Less weight means the Soldier can carry a greater basic load without increasing his combat load above what he now carries. Lower weight will also reduce the logistics burden by making bulk shipments of ammo lighter and requiring less space than that required for conventional Class V.

The development of caseless ammunition has required overcoming a number of technical problems. Foremost among these is the stability of the propellant compound; it must be impervious to moisture, tough enough to resist handling without chipping or crumbling, resistant to cooking off in a weapon heated by prolonged rapid or automatic fire, and it must be tolerant of extremes of climate and temperature. The progressive burning nitrocellulose rifle powders of today deliver

Rounds photographed provided by David S. Stieghan

From left to right: 1) .52 Cal. Sharps Nitrated Linen 2) .52 Cal. Spencer Copper 3) .58 Cal. Mucilage Glue Binder 4) .58 Collodion Binder 5) .58 Cal. Nitrated Paper 6) .52 Cal. Sharps Nitrated paper.

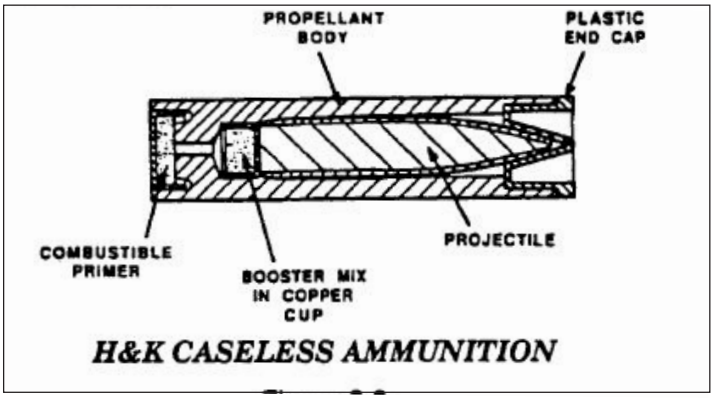


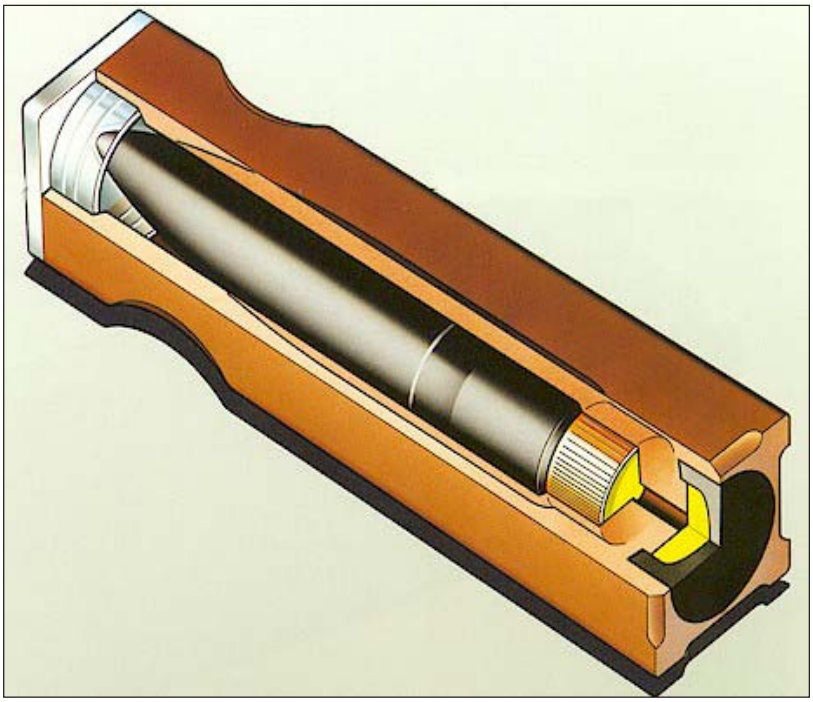
Figure 2 — Heckler & Koch concept sketch of a typical caseless round

acceptably consistent muzzle velocities — and concomitant energy levels — across a wide range of temperatures in regions from the arctic to the deserts of the Middle East. As we approach the development of caseless rifle ammunition the performance of the present service round, the 5.56mm M855 cartridge, is the baseline. As a minimum, any round selected must deliver the same lethality as the M855, and at the same or lower cost.

We have not been alone in our research and development efforts; during the 1970's H&K and the Dynamit Nobel company produced and successfully tested the G11 4.73x33mm advanced assault rifle and ammunition. (Note: 4.73mm is the diameter of the 50-grain bullet and 33mm is the overall length of the complete round.) A round of ammunition (Figure 3) is approximately 40 percent shorter, 15 percent narrower, and lighter than the M855, and the G11 test rounds delivered a muzzle velocity in excess of 3000 feet per second. The collapse of the Soviet Union and the subsequent reunification of Germany posed economic challenges that caused the German government to halt the G11 program in 1990, and the rifle never entered production.

The United States Army is continuing to actively pursue the caseless round concept for both rifles and machine guns, and has procured sufficient ammunition for continued testing. Once sufficient prototype weapons have been procured and ballistic testing is completed, further evaluation will identify the requirements for the next stage of development. We now need to determine the formulation of the best propellant, arrive at the most cost-effective production process, continue to deliver ammunition for testing and evaluation, and scale-up the process for pilot-scale ammunition production. If and when we adopt a caseless rifle as our service weapon, we are going to need ammunition, and lots of it. The industrial base of this great nation has never let the Soldier down, and we will continue to count on its enormous manufacturing capability as we move ahead to confront the enemies of the 21st century.

Figure 3 — Schematic of H&K G11 round



From H&K open source data, courtesy of USAIC Combat Developments

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