

The Saga of the M16 in Viet Nam (Part 2)

By Dick Culver

In Part 1, I covered the saga of the M16 from a standpoint of personal remembrances. The trials and tribulations of the average grunt carrying "the little black rifle" in the field were especially frustrating because we were swallowing the party line totally. As far as I knew, my Corps had never lied to me before, and I could see no reason why they would. As it turned out, they too were being lied to, but too many in high places had put their "chop" on the "give us the M16 now" requests. Human nature dictates that very few people in high places like to back down, apparently even when lives are at stake (as long as it isn't their life of course). Marines, too, tend to "link arms" and assume a "we'll take care of our own" attitude and I assumed that this was simply an extension of this prevalent attitude.

One statement by an outraged Colonel on the Division Staff finally changed my mind on the "we'll bite the bullet and fix this thing ourselves" attitude. When Mike was called up to the Division Headquarters over the infamous letter published in *The Washington Post*, this Colonel asked Mike, "Lieutenant, where's your loyalty to the Marine Corps?" (asked in a tone that indicated that the Colonel considered Mike to be a disloyal SOB). Mike turned the tables and asked the Colonel if they had lied to them in Basic School (the USMC Basic Officer's Course)?

"What are you talking about?" asked the Colonel.

Mike replied, "we were told in Basic School that loyalty in the Corps went down as well as up! Does this mean that loyalty is only to be expected from the bottom up? The men of our company have been told from Boot Camp that the Corps takes care its own, and that's what I'm trying to do. I've followed all the rules and regulations concerning malfunction reporting, with absolutely no results other than feedback that indicated that I was lying in my reports. I only stepped out of bounds when it became obvious that careers were more important than the lives of our men. Obviously the average Marine is expendable if political correctness appears to be at risk!"

The Colonel dropped the subject.

While I (mercifully) didn't get in on the above interview, the word spread like wildfire on Mike's return. I took it rather personally when it appeared that careers and reputations were more important than saving lives, and it became a sort of self imposed holy cause on my part to get at the truth. Some of the story below is a matter of personal opinion, and I have tried to identify that portion rather than simply make my point(s) by tall tales and innuendo.

All the above having been said, here are the distilled results of what I found during the ensuing years. I have not attempted to make this a textbook, but a "what went wrong and why" primer. If you want more detailed information there are whole books out there on the subject. Many of the below listed facts are drawn from available documentation, and some are simply the result of personal experience. As I pointed out in Part 1, the Marine Corps, with a rather warped sense of humor, sent me to graduate school to become an ordnance engineer. While a degree doesn't necessarily make you an expert in anything (except on

paper), people tend to listen more readily when you wave a degree at them. One of more interesting things about this one is that, having grown up around weaponry all my life, I knew virtually everything about small arms ordnance that I know now, before I went to school. I wrote an eight page statement on the problems (or at least my observations on the problems) with the M16 during the investigations of 1967, one copy of which was sent back to the 9th Marine Amphibious Brigade on Okinawa. A friend of mine stationed at the Brigade Headquarters, was sitting in the office when they read my statement. Since this individual was a long time friend, he listened with more than average interest when they got to mine. The Colonel reportedly read my contribution and tossed it in the trash can with the comment, "just who in the hell does he think he is? – some kinda' expert?" From the time I heard of that one, I swore that I would find the truth, and here are the results of my efforts. Unfortunately not everything is documentable, but the information fits into the jigsaw puzzle rather well. Here we will deal with the problems and misconceptions surrounding the M16 Rifle and attempt to show what went wrong. The tale is rather twisted, but bear with me on this.

Background (The Armory System of Weapons Development):

You must understand that for many years there had been a faction of the American Public that was not happy with our "Armory System" of weapons selection. Rightly or wrongly, there had always been a feeling from the American public that the "small time" arms designer could not get a fair shake when it came to a new ordnance concept. The attitude also prevailed that any rifle or rifle design submitted to the Army had little or no chance of getting fairly evaluated, due to the "Not Invented Here" attitude of Springfield Armory. Although probably not true, that feeling was in the air when the M1 Rifle was selected as our new service rifle. The M1 had a myriad of nickel-dime problems with the first production models, such as the infamous 7th round stoppage, the rear sight that refused to hold its elevation and other problems. Melvin M. Johnson stepped in with his recoil operated rifle that tested very well indeed against the Garand, but was "picked to pieces" on little things, with the Army Ordnance folks pointing out the obvious superiority of the M1. The Marines weren't so sure. One contingent under Capt. (later Brig. Gen.) George Van Orden, the founder of the Marine Corps Ordnance School, were proponents of the Johnson Rifle, while the test conducted by the Marines on the West Coast held the M1 to be the best of the semi-autos, but chose to go with the M1903 over both of them.

While I think the Johnson was a fascinating rifle, I'm personally damn glad that they picked the Garand. The Armory system actually made very few mistakes, but the public is a fickle mistress. I am reminded of the apocryphal inventor (as an example) who always claims that HE had the final answer to the "gasoline mileage" breakthrough, but the Government (or, the big Oil Companies, or whoever) came along and bought his patent (or paid him not to market the invention, etc.). At any rate, you get the picture, every inventor is convinced that HE had the answer, but no one would listen (or look, or whatever...). I'm not saying that some of this isn't true, but a large portion is pure hogwash.

The reason that many of the inventors were turned down by the lads at Springfield Armory was that they (Springfield) had already tried many of the ideas and found them wanting. There are very few "new" concepts in weapons design, once you get past the basic operating systems (manual, gas operated and recoil operated), although there are variations of incorporating them in a design (the short stroke piston, long versus short recoil, etc.). Most of these neophyte inventors wanted the government to take their ideas and run with them (spending Government money on R&D of course), and when the Government didn't bite, the

legend was perpetuated. Generally speaking, inventors who had developed a working model of a new design were welcomed at the Armory, and the weapon given a fair shake (John Garand falls roughly into that category). If one of these inventors happened to be working for a large corporation (such as Eugene Stoner and ArmaLite/Fairchild Aircraft), things changed a bit. The large corporation(s) had enough money to develop a new system on their own. Once major money was involved, (with a certain amount of ego or true dedication to their new idea cranked into the equation), the organization and/or the inventor tended to get irate if the Government didn't jump on their new "gizmo" with both feet, kiss them on both cheeks and ask them why they didn't come forward sooner! When this didn't happen, the organization would often complain to their local Congressman or Senator, claiming Armory favoritism. Such things can tie things up in court or force the Government to try their latest gadget by greasing the appropriate palms, appealing to sympathetic Congressmen, or airing their grievances in a news hungry press. Since many constituents had stock in such corporations and more often than not distrusted the Government, political pressure was brought to bear that would not have been possible in a government procurement system; and therein lay the problem.

I am certainly not downplaying Eugene Stoner's genius in the arms designing field, but he was playing hardball in an arena with considerably more interest in profit margins than operational suitability. Eugene was indeed a talented gun designer, and perhaps rivaled John Browning in some respects, but every time he came out with a new design, Fairchild Aircraft would have more money invested in his concepts, and of course THEY had stockholders. His initial efforts were on the M16's big brother, the AR-10. The AR-10 was essentially the little 16 with steroids. It did in fact use a man sized cartridge (the 7.62 NATO), but to put it politely, it was a "beast" to shoot (I've tried one of the original versions)! It would supposedly float with about 1" of the buttstock protruding from the water if thrown in a swimming pool (you'll have to take their word on that one, as I never tried it). The Government had been experimenting with a smaller service round for some time along with several other ideas such as the SPIW, and multiple projectile 7.62 rounds, but never with any real success. With the 5.56 (.223), they came upon a saleable product.

Enter the Air Force:

While initially, the U.S. Army wasn't buying, the Air Force thought it would be a marvelous replacement for the aging .30 Carbine. Over many objections, the Air Force (with the support of General Curtis LeMay) finally obtained permission to buy a number of the little AR-15s as an airfield perimeter defense weapon. This was probably a task worthy of the "mouse gun", but would hardly qualify the weapon as a suitable rifle for the front line Infantryman.

Comparative Cartridge Ballistics:

In order to appreciate what the infantryman was giving up with the 5.56 mm, it is necessary to look at the specifications of the two cartridges and compare them to other rivals of the time – AND compare the results with the pipsqueak .22 Long Rifle:

7.62 NATO (M14 & M60 Machine-gun):

Bullet Weight = 150 grains

Nominal Muzzle Velocity = approximately 2700 fps.

Muzzle Energy = 2427 ft. Lbs.

Residual Energy at 500 yds. = 1576 ft. lbs.

5.56 NATO (XM16E1):

Bullet Weight = 55 grains

Nominal Muzzle Velocity = approximately 3185 fps

Muzzle Energy = 1239 ft. lbs.

Residual Energy at 500 yds. = 252 ft. lbs.

.22 Long Rifle (Generic .22 Rifle):

Bullet Weight = 40 grains

Nominal Muzzle Velocity = 1335 fps. (high velocity ctg.)

Muzzle Energy = 158 ft. lbs

Residual Energy at 500 yds. = ?

7.62 X 39 (AK-47):

Bullet Weight = 125 grains

Nominal Muzzle Velocity = 2400 fps.

Muzzle Energy = 1598 ft. lbs.

Residual Energy at 500 yds. = 414 ft. lbs.

.30 Carbine:

Bullet Weight = 110 grains

Nominal Muzzle Velocity = approximately 2000 fps.

Muzzle Energy = 976 ft. lbs.

Residual Energy at 500 yds. = 182 ft. lbs.

If you will notice, these figures list the velocity and energy both at the muzzle and for the maximum effective range of U.S. (shoulder) Small Arms, (generally figured to be approximately 500 yards or 460 meters). The proponents of the AR-15/M16 attempted to change the maximum effective range of the U.S. Service Rifle to 300 yds. as a more realistic figure. What they were really saying, was that the 500 yd. figure made the AR-15 look bad in comparison to the M-14, but the Army decided to stand fast. The 500 yard figure had been taken from the combat experience(s) of a number of wars. Experience and first hand observation are hard to refute, unless of course, the figures of a conceived scenario better suit your purposes... and not all wars can be guaranteed to be fought in the jungles of Southeast Asia. Even for the mathematically challenged, it should be obvious to the most casual observer that the 5.56mm isn't in the same league as the 7.62mm NATO.

If you compare the muzzle energy of the .22 LR to the terminal energy of the 5.56mm NATO at 500 yds., you will find a difference of only 94 ft. lbs. Not exactly what I would

consider a definitive difference. Sure we are talking muzzle energy compared to the residual energy at 500 yards, but the 5.56mm was (is) touted to have a maximum effective of 500 yards. Dream on! Accuracy, interestingly enough, has never been the problem. No one has ever complained about the accuracy of the "Mouse Gun" (after the change from a 1-14 barrel twist to a 1-12). Initially at least, the problem was the reliability of the issued weapon. Quite frankly, in 1967 I used to dream of a Marine Rifle Company armed with M1903 Springfields! I would have laid money that such an outfit could have taken Hanoi if given the mission. Nay, 'twas not *accuracy* that was the problem...

At that same 500 yards, there is a difference of 1324 ft. lbs. of energy remaining for the 7.62mm in excess of the energy of the 5.56 mm. The 5.56 is down to a puny 252 ft. lbs. versus 1576 ft. lbs. for the 7.62 mm. Only the .30 Carbine is outclassed by the 5.56 mm at 500 yards, and it (the .30 Carbine) was designed as a replacement for the pistol cartridge. No one in their wildest imagination would place the .30 Carbine's effective range in excess of 300 yards. Yet even at that range the Carbine still retains 273 ft. lbs. of energy which exceeds the 5.56 mm's remaining energy at its advertised maximum effective range by 21 ft.lbs. Folks, something is wrong here! To the best of my knowledge, there is not a single state in the United States that will allow the 5.56mm NATO round to be used as a hunting cartridge for a deer sized animal (a good sized deer will go up to 150+ pounds, or roughly human sized). Why in their remotest dreams the military feels that a cartridge that is acknowledged to be suitable only for varmints is a viable anti-personnel round, is beyond my comprehension.

Penetration was not the long suit of the 5.56mm either. The common "Grunt" soon became aware that the "mousegun round" often ricocheted off of bamboo thickets, and had little effect on earthwork emplacements. The U.S. Ordnance manuals list the penetration of the .30-'06 as M2 ball as 36" of oak at 200 yds. Since the ballistics of the ball 7.62mm round are essentially the same, I can only assume that the 7.62 will do the same although I have never tried this personally. I DO know that a .30-'06 AP round will punch a power transmission pole at 200 yards like Swiss Cheese. I've been waiting for some bad guy to hide behind a telephone pole for years! The initial demonstrating teams for the 5.56mm loved to show the effect of the "mouse gun round" on a concrete block wall at 25 yards when the rifle was fired in the full automatic mode. The effect was truly awesome! I asked the demonstrating ordnance folks to try the same stunt at 200 yards. They grinned and said that such a demonstration would not give the desired impression of power. In other words they had the demonstrations rigged in favor of the 5.56mm! I wonder how many feet of oak the 5.56mm will penetrate at 200 yds?

The rather miserable penetrating power of the mouse gun was proven to me in spades during a rifle requalification firing session on Okinawa in 1973. CWO-4 Marine Gunner Dave Luke (a former U.S. Service Rifle Champion) was supervising the butt detail. The rifle range at Camp Hansen is built between two mountains along the long axis of what can only be termed a wind tunnel. The wind on the Rock would often come whistling down that cut in the mountains giving a headwind of 25 mph. So it was on the day in question. The Marine Corps, being frugal, does not use fresh targets for each day's firing, reserving the virgin targets for qualification day (usually Friday). As a result, we used multiple target faces (repair centers) on our targets during our practice sessions, held to the target with a rather disgusting paste of roughly the same consistency of flour and water. This stuff dries hard, and after several days, the thickness of repair centers becomes relatively thick. Since this was a Wednesday, we had

a fair thickness of repair centers on the targets. I was stationed on the firing line when I got a call from Gunner Luke in the butts.

"Hey Major" said the Gunner, "I've got something down here you need to see!"

"What's that Gunner," I replied.

"Major, we've got bullets sticking in the target faces!" said Luke.

"The hell you say Gunner?" sez I, "wait one, I'll be right there!"

I called a cease fire and headed for the butts in the safety vehicle. When I got there I could hardly believe my eyes! Sure enough, there were a number of projectiles that hadn't completely penetrated the multiple target faces at 500 yards. For a moment, I considered that the Gunner might just be pulling my chain, and inserting spent projectiles in the bullet holes for a joke. Two things changed my mind. First, while Dave Luke has a sense of humor, it doesn't run to things like that, and secondly all the projectiles stuck in the target faces showed no evidence of having struck anything more solid than a thick piece of paper. Not only that, but Dave was a professional range officer and we were conducting practice for a Battalion requalification program. Any undue delays would have reflected unfavorably on Dave's ability and he was not one to have allowed anything to interfere with his duties unless he considered it extremely important.

While I had never been a proponent of the mouse gun's, even I would not have thought that the M16 was this underpowered! You can now understand why I am somewhat skeptical of the claims of an 800 yard maximum range for the new M16A2. An additional 8 grains of bullet weight is incapable of making a major difference in penetration, and at 800 yards - ? Right, and my name's Mickey Mouse! No wonder the folks developing the M16 wanted the maximum effective range reset to 300 yards!

The "Meat Ax" Effect:

Yes you say, but what about that fantastic "meat ax" effect that the 5.56mm round has on flesh? Won't the 5.56 mm tear a man's arm or head off if it hits him? In a word, no! This is a myth that has been perpetuated since the AR-15/M16's earliest days, and here is as good a place as any to lay this claim to rest! The original .223/5.56mm was derived from the little .222 Remington or at best the .223 Remington Magnum Cartridges. Now the .222 Remington and .222 Remington Magnum originally used a 40 or 45 grain bullet and a 1-14 barrel twist. Ballistic engineers found that 55 grain bullet pushed the stability of the 1-14 twist to the absolute limit in terms of stability. The initial rounds loaded for the 5.56mm were marginally ballistically stable, and tended to tumble if anything got in its way.

This was apparently especially true of flesh. A 55 grain bullet striking flesh when only stabilized with a 1-14 twist, tumbled with devastating results, but it had a problem – it was only marginally accurate. Now it's possible to have a bullet that is known to tumble, but if it won't reliably hit the target at the maximum effective range you are in big trouble. After the initial test results (including some in Southeast Asia) were in, it was apparent that this WAS an effective round (assuming that a tumbling bullet was employed)! However, it also became obvious that this rifle wasn't exactly a "tack driver" in terms of accuracy. Air Force cold

weather tests in January 1963 showed definite "bullet wobble" around the projectile's rotational axis causing unacceptable accuracy. As any good ordnance folks would do, they tightened the twist to 1-12 and the accuracy improved. The order to change the barrel twist was signed by Robert S. McNamara on the 26th of July 1963. The accuracy immediately improved, but the "magic bullet" quit tumbling! All of a sudden, we had a reasonably accurate round with a bullet that was essentially ineffective in terms of cleaving flesh with the much vaunted "meat ax effect". The round was now reasonably accurate as stated, but much underpowered for its designed maximum effective range of 500 yds.

The Demise of Springfield Armory:

Unfortunately for the America, one lone solitary event was to doom the Armory system of weapons procurement. Robert McNamara had come to power with JFK in 1961. McNamara made no secret of the fact that he considered the Armory system to be wasteful and hidebound. He made a clean sweep of the former Pentagon ordnance experts and replaced them with Ph.D.s and private sector cronies, most of who had no clue as to the difference between a muzzle and a trigger. Many of these gentlemen were former members of the Rand Corporation "Think Tank". My experience with such "experts" has never been one to give me a warm fuzzy feeling as to their real world expertise. Robert McNamara made no bones about his disapproval of Springfield Armory, and would have liked nothing better than to close it down. The only thing saving Springfield was the fact that it resided squarely in President Kennedy's home state of Massachusetts, and was essentially under his protection much as was the Boston Navy Yard. One fateful day in November 1963 changed all that, and from that moment on, Springfield Armory was living on borrowed time.

The (deliberate?) Perpetuation of a Misconception:

Following the official change of barrel twist rate, a bit of disinformation (perhaps better classified as marginal dishonesty) kicked in! The individuals attempting to sell the 5.56mm as the new service cartridge had lost one of their major selling points! We were now armed with a weapon that would poke knitting needle sized holes in the enemy, but without the so-called "devastating effect" of the bullets fired in the 1-14 tubes. Since the individuals in love with the mouse gun concept were in the "selling" mode, they were somewhat reluctant to inform the powers-that-be (and the American Public) that we were no longer dealing with a "devastating" round. This is of course understandable considering human nature, but still a bit "iffy" in terms of honest evaluation of the effectiveness of the prospective cartridge for our primary "go to war gun".

Unfortunately, a sizeable portion of the American Public still believes in the "meat ax" effect of the M16. As a quick anecdotal story, while I was in the early throes of learning to live with the little black rifle, I went to our Battalion surgeons, and hospital corpsmen with a question.

"Had they seen anything during their treatment of wounds that would indicate that the 5.56mm hit harder than any other round?"

I received a negative answer, but they promised to start investigating more closely. A daily check during periods of intense combat always turned up the same answer. None of the devastating effects described by the M16's most ardent proponents, were being encountered

by our medical folks. We were not privy to the above technical information in the Spring and Summer of 1967, of course. Having been told of the rifle's extreme effectiveness before the Battalion left Okinawa to assume the duty as SLF Bravo, I was beginning to have personal doubts about the Brass' evaluation of Colt's latest toy.

Quick Fixes by the Troops:

I could have lived without being armed with a "meat ax", but I as a professional infantryman was loath to have a rifle that would not repeatedly "go bang" when called upon to do so. We tried everything we could think of to remedy the problem. We were keeping our rifles as clean as any man could whose life depends upon such cleanliness. Still... there was a nagging doubt. After all, the ordnance folks were Marines, and surely they wouldn't lie to their brothers would they?! As a result, we tried different lubes that wouldn't pick up dirt, and even tried washing the rifles in gasoline pilfered from the motor transport types. A favorite of the time was some stuff called "*Dri-Slide*" (I'll have to take a hit on spelling here, as I remember it being a proprietary one). *Dri-Slide* contained a highly volatile carrier with something akin to powdered graphite that would deposit a "non-sticky" lubricant on the metal when the carrier evaporated. The U.S. Mail was burdened with many cans of *Dri-Slide* being sent from home to the Marines in Northern I Corps.

Anything greasy seemed to pick up powder residue and acted as a carrier of the stuff to ensure that the abrasive residue was distributed in a fashion reminiscent of lapping compound. This was obviously bad "ju-ju" to a rifle that already seemed to be more than slightly susceptible to dirty powder and the residue of battle. Immediate temporary fixes amounted to such things as having your cleaning rod assembled and taped to the side of the rifle, much in the style of the Civil War musket. By making a couple of loops with ordnance tape (also know to the airborne troops as "rigger's tape") with a piece put inside the loop to prevent the sticky side from impeding the rapid withdrawal of the "ramrod", your makeshift ejector was more easily accessed for immediate use. Unfortunately this was a double-edged sword. When a man was wounded and medivaced, the cleaning rod was often lost in an attempt to evac the Marine's rifle and his personal gear with him.

Under ordinary circumstances, this wouldn't have constituted a problem, but don't forget, we were issued one cleaning rod per rifle and there were no replacements available. As a result, many of the rifles issued to new replacements (taken from our wounded) were issued without cleaning rods, but, with the instructions to "use your buddy's." Most of the individuals that were medivaced were wounded due to the fact that their rifles malfunctioned; thus the rifles that were reissued, were those that were most susceptible to jamming and needed a cleaning rod to be used as an ejector (as opposed to a cleaning device). An already bad problem was being compounded.

An Analysis by the Bad Guys:

During my latter days with 2/3 I served as the Battalion Intelligence Officer. One of the reports that came in was an intercepted message from the Viet Cong (Vietnamese Communists). The VC were not as well equipped as the NVA (the North Vietnamese Army - the regular Vietnamese Army people who operated primarily in the North just south of the DMZ).

We as Marines, usually policed all (or as much as we could find) of our equipment left on the battle field by our wounded. Most of course, was sent to the rear with the wounded man, but there would occasionally be items on the battle field by the departing units. The VC used this recovered equipment to equip their own rather meager supplies as would any good guerilla force. The intercepted document reinforced this practice, exhorting the VC troops to police the battle fields for usable equipment. This document however, had one telling exception to the rule. It stated that all equipment was to be picked up with the exception of "the little black rifle" which is useless to our cause!

I knew exactly what they were talking about!

Enter Ball Powder:

Had we but known, the problem was not simply dirty powder or a lack of regular and conscientious cleaning by the operator, but was due in fact to the burning rate(s) and burning temperature of the powder coupled with varying gas-port pressures depending on the powder. It seems that the AR-15/M16 was developed and tested with extruded IMR (Improved Military Rifle) powder. This powder is relatively clean burning, but has a relatively high pressure peak during its initial ignition. Remington had been using some stuff called IMR-4475 that worked extremely well, but wasn't terribly consistent from lot to lot. Remington had solved the problem by using selected lots of the powder to obtain the desired burning rates and functioning in the M16. In fact the entire testing had been accomplished by using such ammunition. The double based powder (so called because it used both nitroglycerine and nitrocellulose in its manufacture) burned hotter than ball powder due to the nitroglycerine content, and the chamber pressures tended to be a bit higher than with say, ball powder. Because of the quality control problems with the double-based extruded IMR powder that had been used by Remington, all manufacturers of the 5.56mm cartridge preferred to use a less finicky ball powder. The argument was essentially that ball powder burned cooler, thus giving less barrel/throat erosion, and had a lower peak pressure, and would stay well within the pressure limits prescribed for the cartridge. The requirement for using only selected lots of IMR powder having been circumvented, not to mention the great amount of ball powder on hand, the problem seemingly had been solved. In May of 1964, the authorization to use "alternative propellants" was signed without conducting any sustained additional functioning tests. Even Gene Stoner himself issued a warning against such a procedure, but to no avail, and unfortunately there were several unsuspected flies in the ointment, much as Stoner had predicted.

The first and perhaps most important one was that they had not bothered to check the "port pressure" of the alternative powders. While it was true that the ball powders did have a lower "peak" pressure, *they also had a higher port pressure*. Let's start this discussion from a simple but accurate premise. All gas-operated mechanisms must be timed. This seemingly simple truism can be applied to automobiles as well as rifles. If there are moving parts involved that are influenced by gas pressure, it is necessary for all of these parts to arrive at their appointed location as designed, and to arrive at the proper time. Since the ball powder had a higher port pressure than the IMR-4475, the gas being vented through the gas tube was under greater pressure as the projectile passed the gas port than would have been the case with the IMR powder. Since the gas was under greater pressure, it should not come as any great surprise that the gas was traveling down the gas tube more rapidly than was normal during its designed functioning cycle. This meant that the gas reached the "gas key" on top of the bolt earlier in the functioning cycle than usual. It did, in fact, arrive while the

cartridge case was still firmly "obtured" to the chamber walls by the pressure of the gasses caused by the ignition of the cartridge.

By way of explanation, "obturation" is a physical process that takes advantage of the elasticity of the brass cartridge case and causes it to expand and conform to the exact shape of the chamber walls. The brass even sticks little fingers into minor (often invisible) irregularities in the chamber, thus sealing the chamber effectively and keeping gas from being blown back into the face of the operator. In of itself, obturation is a very good thing. The problem here, however, is that the gas reaching the bolt was arriving before the case obturation had subsided and the residual chamber pressure would not allow the brass to be easily broken loose from its hold on the chamber walls, extracted and ejected. The high port pressure and resulting delayed duration of case obturation often, if not usually, caused the extractor to either "jump the case rim" or pull through it, causing the case to remain in the chamber.

This "stuck case" problem was compounded by the fact that the ball powders being used by Remington (CR8136), Olin and Federal (WC846) were much dirtier burning powders than IMR-4475, and tended to "dirty" the rifle chamber area much quicker than the earlier powder. The dirt that deposited itself in the chamber and feeding areas of the rifle added to the extraction problems – dirty chambers tend to resist extraction to a much greater extent than clean chambers by increasing the coefficient of friction between the case and the chamber walls, thus making the cartridge case more reluctant to leave the chamber. Even dirty chambers can be kept clean with constant care, but unfortunately the dirty powder was aided and abetted by a calcium carbonate deterrent coating applied to the powder that added to the fouling problem. Alas the problem grew worse.

The higher port pressure of the ball powder also increased the cyclic rate of fire of the M16 (already too high in my opinion – the ideal rate of fire for a full auto is normally 500 rds. per minute). These started out at about 775 rds. per min. and sometimes reached 900 rpm in extreme circumstances. This was to become abusive to the rifles in light of what followed.

The Chrome Plated Chamber and the Watermelon Seed:

OK, we will now leave the Army wrestling with the ball powder problem, and switch to the "quick fix" that was instituted as an interim solution to the criticism descending upon the military hierarchy. The first was the chrome plating of the chambers (and later the bore). It was reckoned that the chrome plating would reduce the coefficient of friction between the chamber and the cartridge case, resulting in easier extraction. Well, yes, and so it was; however, let's analyze the side effects. Have you ever taken a "still slimy watermelon seed" and squeezed it between your fingers and watched it as it squirted out? I'm sure everyone has tried that one at least once unless you are a permanent resident of the South Pole. What was happening was that with the reduced coefficient of friction and the easier to clean, slicker (and of course *tapered*) chamber, the brass was extracting considerably easier and almost squirting (much like the watermelon seed) the case out and causing the bolt to come to the rear with greater velocity than normal. That coupled with the increased cyclic rate (compliments of the ball powder) caused the rearward traveling bolt to batter the receivers rather badly. Since the timing problem had not actually been solved, this meant that the brass was being extracted while the case was still at least partially obtured in the chamber. As long as nothing else went wrong, this didn't seem to cause any catastrophic failure of the rifle, watermelon seeds notwithstanding.

Another Aspirin for a Brain Tumor:

Rather than "retime" the gas system, or switch to a more stable IMR powder, the Army chose to stick with ball powder, as literally millions of rounds were on hand and there was a shooting war in progress. Now that the stuck brass problem had lessened (but had not been totally been alleviated), the next bugaboo was the "receiver battering problem". That one was fixed with the usual "aspirin for a brain tumor" prescription! Colt and the Army simply went with a heavier buffer group to lessen the impact to the frames, leaving the cyclic rate of fire unacceptably high, but at least the rifles were shooting after a fashion. The military was breathing a sigh of relief to have the U.S. Congress off their posteriors, and the entire problem was swept under the rug and seemingly forgotten, by all except those of us who had been the guinea pigs on McNamara's think tank solution to weapons procurement.

And Now, Slam Fires Too!

In the middle of all our malfunctions, we had another dangerous problem that reared its ugly head. In the middle of a pitched battle in June of 1967, my company had two M16s literally blow up during firing! I was already pulling my hair out, but this seemed to be the final straw. These two stalwart lads had been firing some of the few rifles that were at least marginally functional. In the middle of a string and within a couple of minutes of each other these two rifles literally exploded in the riflemen's hands. Apparently, when the bolt closed, the rifle fired as in a "slam fire" scenario, and the rifles fired out of battery. This explosion blew off the carrying handle and most of the upper receiver. The remaining force blew down through the magazine well (bulging the well on both sides), leaving the magazine tube in the well, but blowing all the rounds and the floor plate out the bottom of the rifle. The operators received scratches on the inside of their forearms from the rapidly exiting floorplates, but mercifully sustained no other visible injuries. In one of the two rifles, the bolt (sans carrier) was still dangling from the locking lugs with a blown case in the chamber. The second rifle was missing the case, the bolt and the bolt carrier. Both rifles were still rather comically held together by the hinge pin. If I had disliked the M16 prior to this, my dislike was rapidly ripening into an overt case of hate. To compound the problem, I had Dave Burrington from NBC News with the company covering the day's rather thrilling events (Dave was a nice gentleman, and he and I got along very well, considering the circumstances). The other newsman tagging along was some roaring a\$\$ hole from ABC News that I would have willingly "done for" if the opportunity had presented itself. My problem was that both of them had their cameramen trying desperately trying to get pictures of the destroyed rifles. This was prior to my crusading phase with the M16 and I was unfortunately able to keep them from taking any pictures. At that point in time I figured our dirty laundry should be cleaned up by the Marine Corps as opposed to a press that was openly hostile to what we considered our way of making a living. After all, we considered our mission was to keep the world safe for God, motherhood and the American Way. If I had only allowed those pictures to be taken, the whole M16 story might have turned out differently. The press might have caused the investigations to have been instituted by outraged congressmen, and Mike and I would not have had to write the "letter heard round the world" – ah well...

It turns out that the slam fire problem, while relatively rare, was well known within the Army Ordnance circles. Rare? ...and I had two within five minutes of each other? Damn, someone was trying to tell me something. The slam fire problem stemmed from soft primers, dirty chambers and a floating firing pin. Obviously a cartridge stripped off the top of a magazine and driven into a dirty chamber (perhaps slightly smaller than usual?) might well

refuse to completely seat. If the bolt was slamming forward with fair velocity, and stopped abruptly with the case almost (but not quite) seated, just short of the locking lugs performing their magic, the weight of a firing pin continuing to move forward (as in Newton's Laws of Physics) might well make contact with a sensitive primer causing the cartridge to fire with the bolt unlocked!

After much study, the Army Ordnance folks recommended a much harder primer, but none of the ammunition companies would bid on such ammunition as they felt that it would cause more failures to fire than it did slamfires. Many fixes were tried including a spring loaded firing pin (versus the floating one), but Colt finally came up with a simple fix that solved the problem. A lighter firing pin solved the problem and the slam fires went away.

Rifles Issued With Known Problems?

While I have checked the ordnance reports of the time, most of the problems that have been discussed were known and supposedly fixed before our Battalion even drew our brand new XM16E1s in April of 1967. Even though many of the problems and the fixes were supposedly known, our rifles still had unplated chambers (actually the chrome plated chamber wasn't approved until the end of May 1967), light buffer groups and heavy firing pins – hell, I don't know, maybe the Navy Medical folks needed the practice, or it was cheaper to write off the older models in combat than recall them for an upgrade. I have the definite feeling that many of the histories were written after the fact and the dates filled in to put those at fault in the clear for posterity to read and judge. Perhaps I judge too harshly, but those were brutal times, and I was young and idealistic – and my bubble had been forever burst.

Smaller Chambers?

One final story and I will conclude this rather rambling discourse. This one is an attempt to explain the 50% of the rifles that functioned reasonably reliably and the 50% that refused to do so. I must interject that the 50% figure I am using is strictly subjective. When we fired these rifles, we made the observation that approximately half of the darned things seemed to shoot and half didn't. Not knowing that we should have kept exact figures for later analysis, we were simply making informed observations. Please keep this in mind during the following discussion.

There were many (unsubstantiated) stories floating around that there was a slight difference in chamber dimension between the ArmaLite chambers and the Colt chambers. While it was reputed to be very minimal, and under ideal circumstances the commercial or military ammunition would work satisfactorily in both guns, under less than ideal circumstance things went to hell in a handbasket. It was rumored that the Colt chambers were ever so slightly tighter than the ArmaLite chambers (a matter of a ten thousandth or so). That would have been no problem in a commercial rifle, but here the work was moved to Colt and they were having labor problems and union shops are notorious for work just good enough to get by. The Colt Union Shop problems were such that a two month strike took place in 1967 over the report that the Army was looking for other (additional) manufacturers to supply M16 rifles to the military.

It was also reported that the quality control at Colt was not as stringent as that at ArmaLite. Don't forget, they (ArmaLite) were trying to sell a new product over the objection of

the Ordnance Corps, and by the time Colt came along the fight had been largely won. Assuming the quality control was slightly looser at Colt, let's take a quick look at the classic "Bell Shaped Curve" (assuming a normal statistical distribution) used in statistical analysis. The "+ side" of the curve would show that at least $\frac{1}{2}$ of the chambers would have been tending toward the *maximum* allowable chamber dimension (statistically), thus giving no problem. The other $\frac{1}{2}$ (the "- side") would have been closer to the *minimum* allowable (Colt) dimension. Unfortunately under this premise, the minimum allowable Colt chamber would have been smaller than the minimum allowable ArmaLite chamber.

One of these "small (Colt) chambers" coupled with the lack of a "retimed gas system" and the admitted powder residue problem caused by the use of ball powder, could explain the mysterious (perceived) 50% jamming problem often present even when the rifles were freshly cleaned. The ball powder would have rapidly fouled the chambers. Thus a cartridge case designed for the slightly larger ArmaLite chamber (with tighter quality control) being forced into a minimum Colt chamber, coupled with higher port pressure and dirty powder, would have strenuously resisted extraction. It is not my intention to accuse Colt of deliberately manufacturing rifles that wouldn't fire. If the IMR Rifle Powder had been retained, there would probably have been no problem. If, however, we combine the smaller allowable (minimum) chamber with a dirty powder, we have the formula for a military disaster.

The scenario would go roughly like this. A cartridge case would be stuffed into a "small chamber" (dirtied with a residue known to result from the ball powder combustion). During the firing cycle, the primer would ignite the powder and launch the projectile down the bore. The resulting chamber pressure would "obturate" the cartridge case to the chamber walls. Since the "gas port pressure" is higher with the ball powder than the IMR, the bolt would start to the rear under the pressure channeled through the gas tube and attempt to initiate the unlocking and extraction portion of the operating cycle too soon. An attempt to extract a cartridge case still plastered to the chamber walls by residual pressure, and further resisting such actions due to the increased coefficient of friction resulting from the powder residue in the chamber would often cause the extractor to either pull through or jump the case rim, leaving the case in the chamber. If the "small chamber" premise *IS* true, it would go a long way toward explaining the "unexplainable problem". I suppose we will never know for sure, but it makes sense in light of what we know today.

A retired Colonel (an Army ammunition expert) told me a story in 1974 that boggles the imagination. This gentleman told me that he was sent to open up the production of 5.56mm NATO ammunition at the Twin Cities ammunition plant in the early 1960s. He asked his boss (unnamed) for the specifications of the 5.56mm cartridge dimensions. He was supposedly told that they didn't have the dimensions and he would have to get them on his own (you've gotta' be kidding!). He told me that he went on an "M16 Rifle safari" to obtain a statistical sample of M16s for making "chamber casts" to discern the correct cartridge dimensions. After a concerted search in such places as Ft. Leavenworth, Ft. Campbell and Ft. Knox, Kentucky, he came up with 17 rifles, all early products of ArmaLite. He took the necessary chamber casts and came up with the cartridge specifications (which may of course have been ever so slightly larger than the later Colt chamber dimensions). While this sounds a bit far out to me, I am in no position to cast stones. Many of the machinations concerning the saga of the M16 are a bit "far out", even though they are verifiably true. If (and this is a BIG if) the tale *IS* true, such an unlikely story would add credence to the "small chamber" idea. On the other hand, the Colonel had no reason to lie, he wasn't aware of my background or previous experiences and we weren't engaged in a "can you top this" sea story session...

The Demise of Ordnance Expertise Within the Army:

In retrospect, the M16 was the result of an open bid system overriding the expertise of an experienced ordnance corps. While we often get better products in a totally free market economy, this procurement system assumes a level of ordnance expertise not normally within the grasp of an inventor and his backers "force feeding" a new weapons system on the military to satisfy the desires and egos of civilian inventors. The Army Ordnance system was not loath to contact talented civilian inventors for their expertise in term of new weaponry, but with the M16 it was a case of the Industrial Complex (of the "Military – Industrial Complex" fame) telling the military what it needed and then forcing them to buy it. The Armory system had worked, and worked well, and we are still smarting from the lack of the expertise that Robert McNamara eliminated along with Springfield Armory using his "bottom line procurement procedures".

The Army isn't always blameless either, as evidenced by their efforts to produce a rifle for all seasons that resulted in giving the M14 an undeserved bad rap. The effort to produce a rifle that would replace both the M1 and the BAR was doomed to failure from the start. I personally feel that the M14 was the *finest* battle rifle ever adopted by the United States, but conversely, it came very close to being the *most unsatisfactory* squad automatic weapon we have ever adopted when employed in the full automatic mode. The full automatic feature and the M14 did not get along well together. It was simply too light to do the job. If we had discarded the full automatic feature of the M14 and substituted the M60 machine gun for the BAR to maintain commonality of ammunition, we would have truly had a Marine Rifle squad of awesome capability! This would not have been the ultimate solution, as the M60 exceeded the reasonable weight of a "squad automatic", but it would have been a fix we could have lived with while a new squad automatic was being developed,

Attempting to have one rifle do everything well is just as unrealistic as having one aircraft that fills every need for our air arm. The F111 was one attempt to do this, and ultimately it failed in its task. It did a couple of things very well indeed, but most aviators will tell you that it is far better to have a really good fighter aircraft, another designed primarily for air superiority, and an attack plane to support the troops on the ground. A bomber very rarely can fill in satisfactorily as a fighter, but still they try. And so it is with the service rifle. Even though the M16 was equipped with a full automatic switch, it made an absolutely horrible squad automatic weapon. Had I had my way, I would have had a talented welder put a bead of heli-arc on the M16 frame rendering it incapable of full automatic fire. Most of today's military experts seem to have forgotten that there is a vast difference between "*fire power*" and "*volume of fire*". Someone should hold classes! Ultimately, the services did adopt the FN (M249) version of the SAW (Squad Automatic Weapon), and it seems to be a fine little gun, although it still shoots an anti-groundhog projectile.

Tactical Considerations and the "All Around Rifle":

In our enthusiasm to come up with the perfect rife, ordnance seems to occasionally forget that a certain amount of cohesiveness of the rifle squad is/was based upon the teamwork necessary to keep the squad automatic rifle in action – at least that has always been the case in the Marines. Early in WWII we traded our old eight-man squad for a 13-man squad composed of three "four man" fire teams and a squad leader. Each fire team had one BAR (a total of 3 per squad) and each fire team's job was to keep the BAR in action. This accounted for the cohesiveness in the fire team I spoke of above, and gave each fire team member a

reason for existence. In the old days, we (as troops) were cautioned that (in combat) if there were only three men left in a squad, all three had better be carrying a BAR. The M14 with its selector switch and bipod did away with all that, as now all the rifles looked the same. The heat of the jungle caused the ever weight conscious Marine to leave the bipod in the rear to cut down on his load. Since every M14 was easily converted to full auto, most were. At this point, the fire team members no longer felt the necessity of covering and supporting the automatic rifleman, since all the rifles now looked and functioned alike; tactics went to hell in a handbasket.

The M16 simply perpetuated the mistakes of the past, except that it was now worse. Now every gun had a "go faster switch" and fire discipline became a thing of the past. I still remember the TV coverage of the battle of Hue with the rifleman sticking his M16 over the parapet by the pistol grip and firing a full magazine without the slightest idea of what he was shooting at. What a waste! Tactics were going the way of the "Do-Do Bird" and everyone was marveling at the number of rounds that the average rifleman was able to fire against our enemy(s), although I began to suspect that our real enemy resided in the Defense Department in the name of Robert McNamara, and leadership in the Military by individuals who hadn't seen combat since the charge up San Juan Hill.

Silk Purses and Sow's Ears:

In the retrospect of 37 years, I sometimes despair. In 1977 when I was stationed at MTU (Marksmanship Training Unit) Quantico, Virginia, one of our former shooters (Maj. Bruce Wincensen) was transferred in the normal course of assignments to the Ordnance Section of the Marine Corps Development Board, and was assigned to the project of coming up with a product improved M16. Bruce did a rather workmanlike job on the project, and when the smoke settled we had the M16A2. While the M16A2 is undeniably an improvement over its predecessors, we are still stuck with a rifle that doesn't qualify as a deer sized hunting rifle in but one or two uninformed states.

As a matter of personal harassment, I used to call Bruce occasionally and ask him how he was coming along with rearranging the deck chairs on the Titanic – his answer was usually unprintable. The bullet weight has been increased to 63 grains, and its accuracy (most especially in the match versions) is superb. The M16A2 (in a match-conditioned version) is now often beating the M14 in match competition, but then the *accuracy* of the M16 has never been my bone of contention. The barrel weight had been increased and the barrel twist tightened to 1-7 to accommodate the heavier bullet. The maximum effective range of the M16 is now said to be 800 meters (someone is smoking something not authorized by the UCMJ). However the M16A2 now weighs in at a hefty 7.9 lbs., just short of the M14's 9.3 lbs. (a difference of a mere 1.4 lbs. but still delivering a projectile with the punch of an anti-varmint device). I hasten to add that the *normally* quoted weight for the M14 was 8.7 lbs, versus the above quoted 9.3. I was simply giving those who would dig out the maximum quoted weight the benefit of the doubt. At 8.7 lbs. the weight differential is just over 3/4th of a lb. heavier than the M16. Obviously, the lightweight rifle had become anything but! The addition of a mere eight grains to the bullet weight (a grain is 1/7000th of a pound) does not fill me with a great deal of confidence or fill me with thoughts of increased lethality. A mouse(gun) is a mouse(gun)...

Mercifully, the Marines were able to take the objectionable full automatic switch off of the M16 and substitute a three shot burst control switch. Many individuals in high positions were

in love with the full automatic feature of the M16 (or any service rifle), and the 3 shot burst was simply included as a "sop" in the redesign of the M16 for those too ignorant to have a grasp of good infantry tactics.

While there is a place for a lightweight full automatic in the infantry TE (table of equipment), it is more properly included as a carbine or submachine gun. The current M4 Carbine, (a variation of the M16A2), works very well and lends itself very nicely use in close combat and for the clearing of houses and buildings in a built up area.

In my opinion, the three shot burst control on the service rifle, means that a pull of the trigger by a "panicked or inexperienced troop" will only result in two wasted rounds instead of 29! Some so-called experts have said that S.L.A. Marshall (S.L.A. indicating General Marshall's initials) claimed that the addition of a full auto switch resulted in more individuals firing their rifles in combat. If this is so, it is a sorry indictment of our military leadership. While some individuals have questioned S.L.A. Marshall's findings in recent times, there are still those who place a great amount of credence in his observations.

A properly indoctrinated combat soldier will not only fire his rifle but he will also get hits on target. The problem is not with weaponry, but with leadership!

And Finally:

The ultimate adoption of the M16 essentially reduced the effective range of the Marine Rifle squad from 500 yards to an optimistic 300, but no one in a position to do anything about it will admit it! A Marine Lt. Col. in the intelligence field was assigned to attend the Annual G2's Conference in 1982 held at Headquarters Marine Corps. He told me the following story in confidence, so I will omit his name for obvious reasons. He stated that a high point of the conference was a brief address by the Commandant of the Marine Corps, at that time General Robert H. Barrow. General Barrow closed the conference with a comment about the new M16A2 Rifle the Corps was adopting. He told them about the developmental work that Maj. Wincensen and the Development Board had done on the rifle and added;

"If I learn of ANY officer or Staff NCO criticizing the new M16, that Marine can tattoo his rank insignia on his collar bone (an exact quote). He'll never be promoted as long as I'M the Commandant!"

Some things never change...

Valhalla and Beyond:

In Norse mythology, fallen heroes were welcomed to Valhalla as a reward for valorous conduct. Those of us in the profession of arms often speak of this, the warriors' final resting-place, where no one grows old, and honor is held in high esteem. If there is an all-knowing and all-wise God, as there must surely be, we will someday meet our comrades in arms at the gates of Valhalla, and shake the hands of our friends... I only hope that we will be as worthy of entrance as those who secured their place defending a cause in which they believed, using a rifle that was not worthy of their bravery and sacrifice.

...And may the Marine Corps always be guided by the words of Marine Maj. Gen. Rupertus' in *The Rifleman's Creed* (included in all the rifle qualification score books in the Marine Corps):

"My rifle and myself know that what counts in this war is not the rounds we fire, the noise of our burst, not the smoke we make. We know that it is the hits that count. We will hit..."

I can only add Amen...

ROC

And a Post Script:

While my story has been mainly about Marines since they are my people and I know them best, I am also painfully aware that many of our Army brothers went through the same frustrating ordeals that were experienced by the Marines in Northern I Corps. To those fine gentlemen, my hat's off to you and for those who gave their lives in the performance of their duties. You have my everlasting admiration and my thanks. The following parody in the style of Robert Service is dedicated to you as well!

For Hotel Company

2nd Battalion, 3rd Regiment of Marines

There were strange things done under the jungle sun
By the men with the "Matty Mattel",
The jungle trails have their secret tales,
Of men who've had a glimpse of Hell.

There were memories clear of loved ones dear,
Who resided on Stateside sod,
By the sweating veterans of jungle fights,
As they cleared their jams with a rod.

These were the Marines of the Infantry line
Who offered the country their souls.
Of men who tried and fought and died
And here their story is told.

'Twas a different time and men of a different breed.
Their story's of danger in a different clime,
Of jungle fights where they fought and died,
With a plastic toy and a cleaning rod...
-- for McNamara's bottom line!

With apologies to Robert Service

Semper Fidelis my friends...

Dick Culver