



4/26/92

Dear Ms. Cooper,

Your comments on William Greer led me to a remarkable discovery which I would like to share with you. Enclosed is a letter which I wrote to Oliver Stone, producer of "JFK", on 4/14/92 explaining it.

If you would like to see the evidence please call me.

Sincerely,

Robert Morningstar



JUSTICE FOR JFK:

*"Magic Bullets
and
The Pseudo-Zapruder Film"*

*How Gestalt Psychology was used to edit History
and change the World's perception of "Reality".*

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APRIL 14, 1992

MR. OLIVER STONE
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Dear Mr. Stone:

Thank you for your response to my letter of March 15th, 1992 wherein I first proposed an infrared study of the Zapriuder film. I now write to you to inform you of my discovery on 3/23/92 of 3 tracer bullet images, previously overlooked or unrecognized by other researchers of the assassination and the Zapruder film. I would now like to present you with a more detailed description of my discoveries.

As stated in my letter to Dr. Silverman, on March 24th, while preparing a preliminary research tape for him and his colleagues, I discovered the tracer images, or "ballistic cracks", of three shots which missed the President but which indicate that there were two shooters on the 6th floor of the book depository and another assassin shooting across Dealey Plaza from a different building!

This discovery confirms the existence of a conspiracy to execute the President by a triangulated attack on his person. My analysis of these three tracers resolves:

1. The "Magic Bullet Mystery";
2. The origin of the fragmented bullet(s) which are said to have grazed a bystander, James Tague;
3. The (until now) inexplicable acoustic anomalies encountered by experts analyzing the sounds of the shots broadcast and recorded on Dallas Police Radio.
4. The temporal discrepancies encountered in trying to explain the rapidity of fire of Oswald's single bolt-action rifle.
***President Kennedy and Governor Connally were struck by semi-automatic weapons fire!**

The unique tracers left by these three bullets indicate that they were not 6.5 millimeter bullets like those characteristic of Oswald's Mannlicher-Carcano rifle, but rather 5.56 millimeter bullets such as those fired by weapons like the M-15 & M-16, which were designed to "tumble" or "wobble" through their flight paths in order to cause more extensive internal damage to the victim by "zigzagging" within them after impact. This characteristic of 5.56 millimeter bullets does explain the "Magic Bullet's" path through Governor Connolly's body, since it was designed to bounce or "ping-pong" off the victims's bones, thus turning what might have been a mere "flesh wound" into a more serious injury by tearing up the victim's internal organs. It also explains the horrific explosion of the President's head wound. (See note below re: Appendix C).

In 1963, the M-16 was the world's most advanced high-tech firearm and available only to the military or high government agencies. (See, Appendix B. Article: "M-16: Wimpy Warrior or Combat Champ?" by Peter G. Kokalis, and Appendix C: Article: "Update: Assault Rifle Ammo" by Kevin E. Steele, both from *Assault Rifles*, Vol. 10, No. 2., New York, 1992.)

Note: compare the nature of permanent wound and temporary cavitation structures demonstrated in photo of Block L-5 of ballistic gel (Steele, Appendix C, p.70) with the characteristics of President Kennedy's fatal head wound.

"One picture is worth a thousand words-Confucius".

Finally, if you study prints of the Zapruder film (full frame), you will find the first tracer cutting across the sign which obstructs the view of the President momentarily before the throat wound. It is on the third frame after the ersatz editing job. In the 1st complete frame after the edit, one can see that the tree trunk line has been juxtaposed to replace a Gestalt vertical reference formerly associated by the viewer's eye with the corner of the concrete porch in the background (Zapruder frames Z202-203-204).

In the subsequent frame, one can see the bullet's trail clearly cutting through the branches on the left side of the tree. It zips from upper center to lower left, shooting out of the tree what I believe to be a sighting reference used to calibrate telescopic sights. It is clearly visible in the frame before, a black "ornament" hanging plum-like, from the lowest branch.

In the "tracer frame", it is gone!

However, on the right side of the frame, a large black spot suddenly appears just above the ragged line formed by the bushes and the wall. This could be the object formerly seen hanging from the tree, deflected, accelerated and expanded by the impact of the bullet or an intentional blotch placed on the frame to distract the eye from seeing the tracer event which is clearly visible on the left side of the frame. *My personal belief is that it is the latter.*

If it is so, then as in the "doctoring" of the three missing frames to create the illusion of the acceleration of the vehicle, this demonstrates a most sinister manipulation and cynical application of Gestalt Precepts and Techniques to artificially alter the viewer's perceptions and "reality".

In view of the trajectory of tracer or the *ballistic crack*, it seems to me that this assassin was forced to throw his shot away in order to avoid hitting Mrs. Kennedy, whose pink bonnet is visible above the sign, obviously in the line of fire with the presumed position of the President who is obscured by the sign. This is the precise moment when the President is said by the **Warren Commission** to have received the first wound in the throat.

The impression of the bullet's ballistic crack and violent wake turbulence mottles the background, demonstrating that it is not a scratch on the film, which would obliterate all the visual information. On the videotape with which I have been working, taped from network newscasts, the tracer endures for three frames before the effect dissipates (in another version it endures for only one), but it appears in all versions of the film which I have been monitoring in recent broadcasts and documentaries since the initial discovery.

With regard to the term "*Ballistic Crack*", it should be understood that the author is using this term in a dual sense. It is both a description of its acoustical properties as in "the crack (sound) of the whip", but it is also a definition of its structural nature as in "a crack (fracture) in the china". I believe that these tracers are actually impressions of an ephemeral "fracture in the atmosphere" caused by the use of a *unique form of ammunition (M193 5.56mm Ball)*, the fact that *Mr. Zapruder must have been almost perfectly still when he recorded this event, and the fortuitous position of the sun, at almost 90 degrees to the line of fire as determined by the tracers and the shadow angles of persons and objects in the scene.*

Nine frames after the first impression (Z214-216), two identical and nearly parallel streaks emerge from the upper left corner cutting across diagonally to lower right near the base of the tree in the center. This happens 2 frames after the head of the Secret Service man in the right front seat first appears after passing the sign.

These two may be the bullets which impacted ahead of the motorcade and, fragmenting the cement pavement, later grazed the cheek of a bystander, James Tague. These shots seem to have been a "timer" vector to set up the death blow.

These shots fired by the "Twin Oswalds" on the 6th floor of the depository cut across the horizontal line formed by the grass and bushes at approximately 30-35 degrees, which would coincide with the 30 degree angle of attack of the fatal shot to the President decreed by the Warren Commission, which comes several frames later.

On my research copy drawn from news broadcast, these tracers endure for two frames (1/9 second), one frame less than the original tracer, the difference may be due to the change in the angle of incidence relative to the sunlight which reveals their effect on the atmosphere or to editing.

"How", you may ask, "could such an obvious thing have been overlooked by so many researchers for 25 years?"

I asked myself that question and upon closer scrutiny and investigation of the so called "botched" edit in frame by frame mode, I had a remarkable revelation:

Contrary to all the obvious signs of sloppy technique, I found the editing of the 3 missing frames to be a masterful and sinister reversal of Gestalt Psychological Laws to confuse, disorient, and distract the viewer from seeing the obvious: *that the car decelerated while passing behind the sign and 3 tracers.*

After finding the 3 tracer images, I began to use a form of reverse psychology, self-interrogation to "disassemble the edit".

"Why", I asked, "did they use the bottom of the top 1/2 of the last complete frame before the splice as the top 1/4th of all the intervening frames between splices while leaving the lower 3/4ths of the sequence intact?"

My answer: to hide something that was too obviously happening in that top 1/4th or "to slip something by us."

I did not wish to conjecture about what might have been happening in the missing top 1/4th (though I have my suspicions), so I asked another question:

"What have they slipped by us and to what effect?"

As we studied the frame prior to the edit, we discerned that at that moment, the corner of the concrete terrace or edifice in the background is established as a *Gestalt vertical reference line* with the right side signpost through the *Gestalt Laws of Proximity (same side of frame), Similarity (verticality), and Continuity*.

From Richard D. Zakia's "Perception and Photography" (Light Impressions Corporation, Rochester, NY, 1979):

"Proximity The closer two or more objects are, the greater is the probability that they will be seen as a group or pattern."

At the moment of the splice, one can clearly see that the back of the sign has been radically "blue pencilled" or "blue penned", disrupting the background (*Ganzfeld*) and forcing the viewer to reject that area of the frame as being devoid of any useful information. At the same time one can see within the blue field an insinuation of the new position to which the right post supporting the sign is to be shifted in the next frame.

The base of the top 1/3 of the "spliced frame" then becomes the top 1/4th of the next 3 frames. This "freezes" the wall in place while the lower 3/4ths of the changing frames move below. The effect produced is that of a lurching and quickly accelerating Presidential vehicle, whose deceptive and false acceleration is belied by the drooping American flag on the right fender.

In the meantime, as the top 1/4th remains static, the bottom 3/4ths change and the original *Gestalt vertical reference line* referred to above is subtly subverted and replaced by the juxtapositioning of the lower half of the trunk of a tree that was "off camera" in the last full frame. The post supporting the right side of the sign has shifted to the position alluded to by the "blue pencilling technique". The left post has disappeared. Two or three frames of the car's emergence from behind the sign have been purposely deleted to create "false acceleration" by the relative movement of the car below, contrasted with the "frozen wall" above. The truncated tree stump stands in silence while "time catches up" with reality, but like other witnesses who have disappeared, its absence suggests that even trees can

testify to the treachery going on around them.

I had noticed that we are first presented with only the bottom part of the tree trunk. The branches are hidden from view until the Presidential flag on the left fender arrives into a nearly complete vertical alignment with the bottom half of the tree and the corner of the still static wall in the top 1/4th of the frame. It has replaced the Gestalt vertical reference originally formed by the corner of the wall and the right signpost "so long ago" (4/18ths of a second).

Suddenly, the entire frame is rejoined, the action resumes "real time" and the whole tree appears! Yet again, I asked myself, "What has been slipped by us (in 4/18ths of a second) by the psychological masters of this 'celluloid shell game'?"

"Well", comes the answer, "they've slipped a wall by you as well as a tree and the branches on the left side!"

Next question, "Why?"

The reason for the "wall-sliding technique" is understandable. The transposition of the wall suddenly to the far left side of the frames continues the spurious sense of acceleration originally engendered by the static wall and moving car. But now, it is the car that is relatively still and the wall "accelerates" in a direction opposite to the direction of the Presidential vehicle, thus perpetuating and prolonging the illusion.

"Now, what about the tree? What don't they want us to notice about this tree?"

Perhaps it is that peculiar black "Christmas ornament" hanging from the lowest branch. It's November 22, 1963, still one week before Thanksgiving, yet someone has hung something on the lowest branch already! It is interesting to note that this is the same tree to which a Dallas Police Officer ran immediately after the shooting, drew his revolver and proceeded to post himself there to "guard" the tree! When interviewed by CBS News and asked why he did so, he stated that he had noticed something or "felt that something had happened there" at the moment that the first shots rang out. He had run there more on "instinct" than on anything specific that he could verbalize.

In the next frame, the first visible streak of an apparent bullet tracer, or "the ballistic crack" appears. Originating precisely at the point that had been occupied by the strange plum-like

object, the tracer streaks over Mrs. Kennedy's head and over the sign, passing to Zapruder's, left side. Zapruder stated that he believed that the first shot had come from his left side. It is very likely that what Zapruder heard was the shock wave or "sonic boom" of the bullet before the report of the cartridge explosion arrived. (See Appendix D: "Noise Sources", Part b.)

By tracking the streak geometrically backwards through the tree, I have determined that this particular shot probably emanated from the second floor of the DAL-TEX BUILDING. This is the building where an Army Intelligence officer, James owell, found himself trapped when the Dallas police sealed the building immediately after the shooting. It is also where another man, James Braden, was arrested and taken into custody on suspicion of having been involved. Powell was released upon identifying himself as "Army Intelligence", joining other Army Intelligence officers who had also been ordered "not to report to that city that day". (See R. J. Groden and H. E. Livingstone, HIGH TREASON, Berkeley Books, 1990, p.185.)

Therefore, I ask "Why were they there?". Was not their presence in Dealey Plaza, then, direct disobedience and insubordination to an emphatic and direct order from a superior officer? Should they not have been court martialed? Finally, why did Army Intelligence destroy all its files on Lee Harvey Oswald. As Groden and Livingstone ask in their book HIGH TREASON:

"Is it possible the men on the Grassy Knoll flashing Secret Service credentials were Army Intelligence agents ostensibly detailed to Presidential security for the day? Were they the assassins spotted by eyewitnesses on the scene?"

During the '60's and '70's, in the absence of access to the Zapruder film, TV news footage on any "assassination issue" was reduced to a stock clip of black and white film showing a "Secret Service" man running across Dealey Plaza (cut), jumping onto the back of the limosine to the aid of Mrs. Kennedy, (cut) other Secret Service men hurriedly jumping into the second car, (cut) Secret Service man on trunk of President's car helping Mrs. Kennedy, limosine racing to Parkland Hospital, (cut to) a policeman guarding a tree, crying crowds outside Parkland Hospital, (Cut to) the President's funeral, John-John saluting, grieving nation? Who dunnit? Next story...

The departure of the Army Intelligence men from Dealey Plaza was captured by CBS News cameras as the men leapt into two waiting convertibles and raced away on November 22nd, 1963.

CBS originally broadcast it "erroneously" as "several suspicious looking men seen leaving the scene of the assassination in a great hurry." Later that evening, CBS News corrected itself on the "suspicious looking men" report and CBS correctly identified them as an "Army Intelligence" team. I saw and remember the original broadcast.

As I study a video tape of the footage today, their "kinesics" still look like panic-stricken "desperados" making a getaway after a holdup, with one of them even leaping "cowboy style" *ONTO THE TRUNK OF ONE OF THE CARS as it is racing away WITH THE RIGHT PASSENGER DOOR WIDE OPEN.* Three "buddies" already sit atop it "Jeep Style ". Two others are frantically trying to catch up. One of them, the man who had run across Dealey Plaza, identifiable by his unique strides and "running style", catches up. The Policeman is picking up his motorcycle by the sign.

This took place 8-12 minutes AFTER the assassination but was then re-edited to make it appear that the man racing across the Plaza turns into Secret Service man Clint Hill jumping onto the rear limosine THEN cutting to the "getaway" (8-12 minutes later in time), MAKING IT APPEAR THAT THEY ARE ALL SECRET SERVICE MEN.

They race away WITH THE MOTORCADE (8-12 minutes earlier) and all go to Parkland Hospital together!

Then, there is a cut and behold:

A Dallas Policeman, gun drawn, is guarding a tree! YES, A TREE! RIGHT AFTER THE PRESIDENT OF THE UNITED STATES WAS ASSASSINATED!

This is another example of artificial alterations of our reality achieved by the criminal misuse of Gestalt Laws in altering assassination evidence. This particular instance was successful because for a split second in Clint Hill's run *FROM ANOTHER CAR IN THE MOTORCADE* to the Presidential vehicle, he "pushes off" the left front fender of the second car in the motorcade, momentarily slowing it down. This instant provided the opportunity for a deceitful juxtapositioning of the second military intelligence vehicle in the "getaway" (departing 8-12 minutes later) into the position of the second vehicle in the Presidential motorcade.

However, despite Walter Cronkite's assertions to the contrary in later years:

THAT'S NOT THE WAY IT WAS, NOVEMBER 22nd 1963!

The death of President John F. Kennedy was a wound to what C.G. Jung called the "World Soul" and none of us who lived through it will ever be whole until there is *Justice For JFK*. Only when we remove the scales from our own eyes and realize that our personal silence was a form of complicity in the cover-up will we be free of the collective complicity of ignorance and self-deception.

Whether out of fear or expediency, too many people remained silent or were silenced. I have tried in this study to provide new evidence and insights into the events of November 22nd, 1963. I also present my findings as a useful resource, a "road map" of the Zapruder film for historians and other researchers in their quest for Truth in history.

Through the alteration of the events recorded in the Zapruder Film, "*Archetypes of the national Unconscious*" (*Truth, Justice and The American Way*) were distorted, desecrated and perverted. We now suffer the neurotic and psychotic consequences of the event in the form of rampant crime, personal violence, drug abuse as well as social and racial alienation. The healing of this "wound to the World Soul" and the reinstatement of the integrity and sacrosanctity of the Archetypes referred to above will not be realized until we achieve *Justice for JFK*.

Mr. Stone, I thank you for your consideration of my ideas and I support you wholeheartedly in your endeavor. You must not flag in your efforts to keep this subject in the public eye and on its conscience. I realize how weary one must get from the incessant attacks on one's integrity and having constantly to defend one's Self against the catcalls and jeers of biased critics. Yet, you must realize that the nation is with you in this challenge, public opinion is approaching *critical mass* and when that happens *nothing can stand in the way of achieving "Justice for JFK"*.

RDM:rdm

Very truly yours,

P.S. I would like to target May 29th, President Kennedy's birthday for public release of this information.

APPENDIX A:

JFK 556:

Ballistic Studies of the Real "Magic Bullet":

5.56mm BALL M196 (M-16 TYPE)

by: *R. D. Morningstar*
Morningstar Aerospace
Resources & Systems
Copyright, 1992

Format is IBM GRAPHICS VGA (320 x 200, 256 color)

To run from hard drive:
Insert diskette in Drive A
Type "Copy A: *.* C:" (ENTER)

To Run Program from "A" or Hard Drive

1. Type "G" (ENTER) or "Gallery f" (Enter)
[No Quotation Marks Necessary]
2. When Gallery Screen comes up:
 - a: Type:"L" to load gallery "JFK556";
 - b: Then simply hit (ENTER) or "Open" (if using mouse);
 - c: Then use "R" key to "run program".
 - d: Program will run animation automatically sequencing
Titles and Graphics;
 - e: To terminate program, hit "Esc" key.



APPENDIX B:

Article:
"M-16: Wimpy Warrior or Combat Champ?"
by Peter G. Kokalis

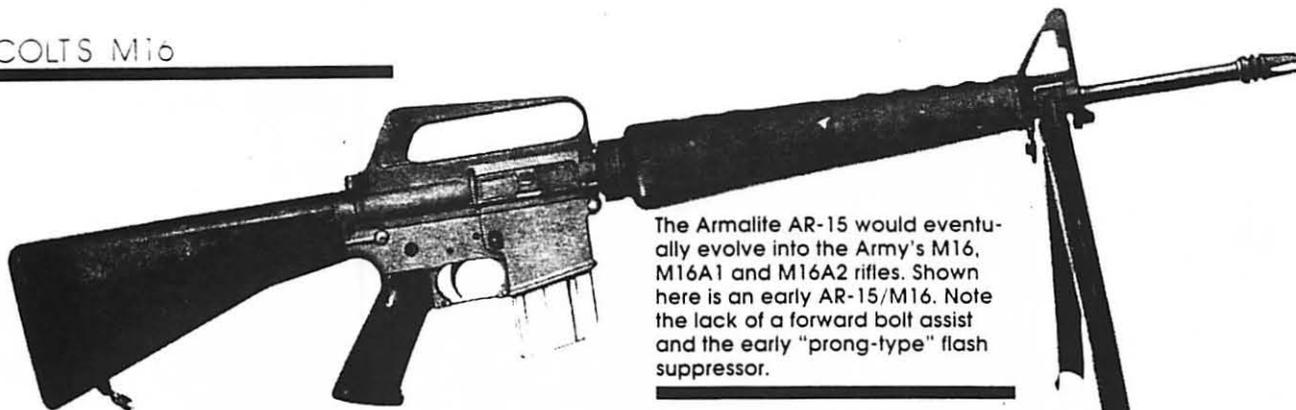
From
Assault Rifles, Vol. 10, No. 2., New York, 1992.

M16-WIMPY WARRIOR OR COMBAT CHAMP?

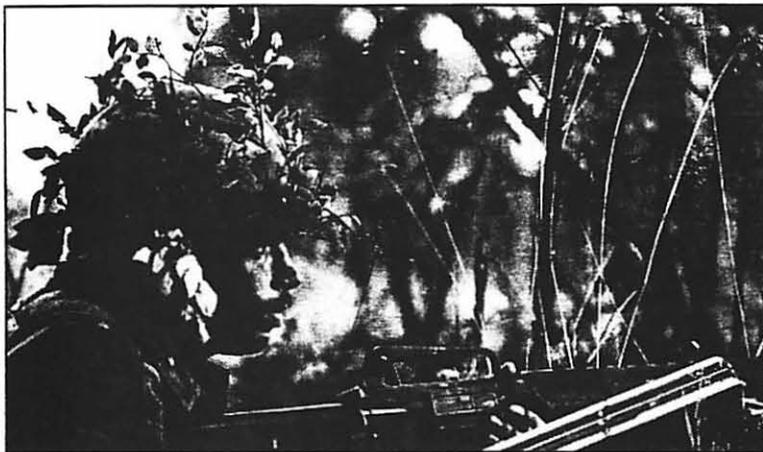
COLT'S CONTROVERSIAL ASSAULT RIFLE HAS WITHSTOOD VICIOUS ATTACKS, BOTH ON THE BATTLEFIELD AND THE HOME FRONT. AN EMINENT MILITARY SMALL-ARMS AUTHORITY SEPARATES THE FACT FROM THE FICTION.

By Peter G. Kokalis





The Armalite AR-15 would eventually evolve into the Army's M16, M16A1 and M16A2 rifles. Shown here is an early AR-15/M16. Note the lack of a forward bolt assist and the early "prong-type" flash suppressor.



Born in swirling controversy, the M16 seemed destined for final extinction by the end of the millennium. However, much to the chagrin of its detractors, who remain numerous and vociferous, and with the virtual abandonment of the ACR (Advanced Combat Rifle) Program and the apparent demise of the Evil Empire, the M16 series will undoubtedly linger on well into the 21st century. Like it or not, in its present form it is one of the world's finest infantry rifles.

When properly maintained, this so-called "Mattel toy" is every bit as reliable as any one of the 50-million Kalashnikovs produced and capable of significantly greater accuracy. In terms of human engineering, the M16 is far superior—as anyone who has attempted a tactical reload in combat with a "Kalash" or flipped the AK's selector during a night ambush can testify. In terms of wound ballistics, either the Vietnam-era M193 or the new M855 ball "pipsqueak" projectiles are demonstrably more effective than the standard issue 7.62x39mm boattail bullet.

EARLY HISTORY

The M16 is a creature of Eugene Stoner, who, at the time of its development (when it was known as the AR-15), was the chief engineer for Armalite, a division of Fairchild Aircraft. The AR-15 was essentially a scaled-down version of Stoner's caliber 7.62x51mm NATO AR-10 rifle. A small quantity of AR-15 rifles were delivered to Ft. Benning by Stoner himself for test and evaluation against the M14 on March 31, 1958. In a simulation of combat environments, the M16 proved to be almost three times

as reliable as the M14. But, General Maxwell Taylor, the Army chief of staff, vetoed any further CONARC development of the AR-15 in favor of the continued procurement of the M14. In December 1959, Colt paid a disenchanted Fairchild Stratons Corporation \$75,000 plus a royalty of 4½ percent on all future production rights to the AR-15.

The AR-15 was tested in Vietnam by the Defense Department in the summer of 1962 under the code-name Project AGILE. The AGILE report was more than enthusiastic, as fantastic claims were made about the .223 cartridge's killing power, as well as the improved handling, reliability, durability and ease of maintenance of the AR-15 over the M14. A favorable cost-effectiveness report followed from the DOD Comptroller's Office. The anti-M14 group now had an alternative to rally around.

A number of Defense Department agencies entered the fray and began comparing the AR-15 and M14. A comparative evaluation between the

two rifles was held at Aberdeen Proving Ground late in 1962. The results were ambivalent. A comparative lethality and wound-ballistics test at Edgewood Arsenal stated that the earlier Project AGILE report of the .223's fantastic killing power was a

gross exaggeration. The official Army reply to Secretary of Defense McNamara's order for the comparative examination of the two rifle systems flatly concluded that "...only the M14 is acceptable for general use in the U.S. Army...."

But too much evidence pointed toward an opposite conclusion. An Army Inspector-General's investigation decided that the Army had rigged some of the tests against the AR-15. As a consequence, McNamara terminated procurement of the M14 rifle on January 23, 1963, and announced a "one-time buy" of 85,000 AR-15 rifles for the Army and 19,000 for the Air Force, believing that an entirely new weapon system called SPIW (Special Purpose Infantry Weapon), firing small-caliber cartridges using steel-flechette multiple projectiles embedded in plastic sabots, was on the immediate horizon.

The intensification of the war caused General Westmoreland in 1965 to request the M16A1 rifle for all ground combat elements in Vietnam. This was accomplished by August 1966. In December of 1966, the U.S. Army type classified the M16A1 rifle and it replaced all .30-caliber rifles in its inventory (except those eventually retained for use as M21 sniper rifles).

VIETNAM PROBLEMS

By the spring of 1967, Colt's bed of M16 roses started to decompose as



Two selective-fire variants of the M16A1, both manufactured by Colt, include the custom carbine at top with 14½-inch barrel, A2-type pistol grip and spare magazine holder mounted to the receiver, and the as-issued rifle below, fitted with the Colt 3X scope, which was frequently employed in Vietnam.

reports of alleged widespread malfunctions in combat began to appear in a media hungry for every negative tidbit about the war in Vietnam. The press gleefully printed melodramatic letters supposedly written by GI's whose comrades had fallen dead next to their jammed M16s.

And there were some very real problems, as there has been whenever a new weapon system is developed and initially fielded. Problem areas and disputes included: bullet shape, primer sensitivity, cyclic rate, extraction, case hardness, barrel twist and bullet stability in flight, and chamber configuration. However, foremost was the change in midstream from a

cartridge using an IMR-type propellant (IMR-4475) to a ball powder (WC846). Innuendoes of intrigue were leveled against the powder manufacturer, Olin Winchester. In truth, ball propellants generally burn cooler (i.e., have a lower flame temperature) than extruded IMR-type powders, extending barrel life because of their lower erosion properties. This is no small consideration for modern, lightweight assault rifles with full-auto capability. The M16 upper and lower receiver bodies are forged and precision-machined from high-tensile-strength 7075 T6 aluminum

alloy, not steel (a far superior heat reservoir). The trade-off (and there always is one) is that ball propellants generate more carbon residue, which, of course, accelerates fouling of the gas system—especially the M16's gas tube, which cannot be cleaned by the operator.

The "ease of maintenance" had been overstressed by both Colt and the Army. The proper cleaning equipment was not issued with the rifle and the troops were not impressed with its importance—this in the humid jungles of Southeast Asia. Corroded chambers led to sometimes fatal extraction failures during firefights. Subsequently, M16A1 chambers and bores were chrome lined.

Early on, some M16s would occasionally fire out of battery as a result of excessive bolt carrier bounce. The same dilemma was encountered by the Soviets when they switched from the forged and milled receiver body of the AK-47 to the lighter sheet-metal receiver of the AKM. Their solution was to install a five-component mechanical device that acts as a drag on the hammer. Research by Colt produced a new, segmented buffer, which eliminated the potentially dangerous carrier bounce. An unexpected additional benefit was a reduction in the cyclic rate.

The receiver on A1 rifles bears a selector switch with three positions: Safe, Semi and Auto. The "Auto" position allows full-automatic or "cyclic" fire at a rate of 700 to 900 rounds per minute.



COLT'S M16

The original bolts could be installed with the extractor to the left, which would prevent extraction of the empty case. It is no longer possible to do so.

Magazines also proved to be a nagging problem. Sometimes troops overloaded them, but their flimsy, almost throwaway design and construction has plagued the system to this day. Original capacity was 20 rounds with an aluminum-alloy, waffle-shaped magazine body. This was increased to 30 rounds during the Vietnam War (first available for issue in 1969), although those who know never load more than 29. The most common stoppage associated with the M16 occurred when the bolt overrode the cartridge base, dented the case severely with the locking lugs and failed to chamber the round. Called a "bolt-over-base" stoppage, it is always a result of faulty magazines. To avoid magazine-induced stoppages, they should be disassembled periodically, cleaned thoroughly and lightly lubricated. With the above exception, the M16's woes are now almost a quarter century in the past. But, the specter lingers on. And for

This Camp Pendleton marine is armed with an early M16A1 rifle that features the forward bolt assist incorporated into the upper receiver, but it retains the M16 "prong-type" flash suppressor.

at the U.S. Army's Wound Ballistics Lab that the large, permanent cavity produced by the 55-grain boattailed M193 bullet is primarily a consequence of bullet fragmentation. As long as this FMJ bullet travels point forward, its wound tract remains small and there is little tissue damage. However, after 2 to 6 inches of penetration, the M193 projectile will yaw to 90 degrees, flatten and break apart at the cannellure (crimping groove). The bullet point remains as a flattened triangular section, retaining about 60 percent of the original bullet weight and penetrating about 13 inches in soft tissue. That portion to the rear of the cannellure



The product-improved M16A2 series of rifles was adopted by the U.S. military in the early '80s. The latest M4 carbine variant at top features a 14½-inch barrel stepped to accept the M203 grenade launcher. This carbine is issued to special operations forces. The standard M16A2 rifle below sports the heavy barrel profile, improved handguard, pistol grip, buttstock and sights along with the controversial "3-shot burst" mechanism in place of the M16A1's full-auto capability.



the M16's critics the bête noire is still the 5.56x45mm NATO cartridge.

WOUND BALLISTICS

A great deal of misinformation has been published about the reasons for the M193 5.56x45mm cartridge's effectiveness. It has been determined

M16A2 rifles also have a three-position selector switch, but the "Auto" position found on the A1 has been replaced by the "Burst" position, which permits only 3-round cyclic bursts.



breaks into numerous fragments that penetrate up to 3 inches radially away from the main wound track (unlike those of most fragmenting handgun projectiles, which tend to remain close to the permanent cavity). These multiple fragments perforate and weaken tissue. Tissue between two perforations is often completely detached when subsequently subjected to the sudden stretch of temporary cavitation. Weakened tissue may be split by stretch that would otherwise be absorbed by the tissue's elasticity.

There is a direct correlation between the bullet's velocity and the fragmentation pattern. At a range of 100 yards, the M193 projectile generally breaks into two large fragments. At ranges more than 200 yards, the bullet flattens somewhat and only a few small fragments squeeze out of the base. If this bullet passes through an arm or leg without striking bone and before it yaws and fragments, damage will be minimal.

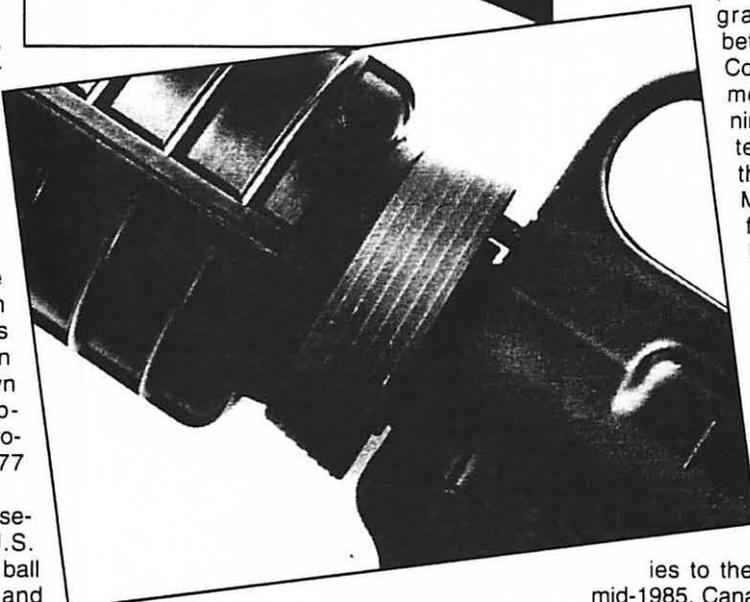
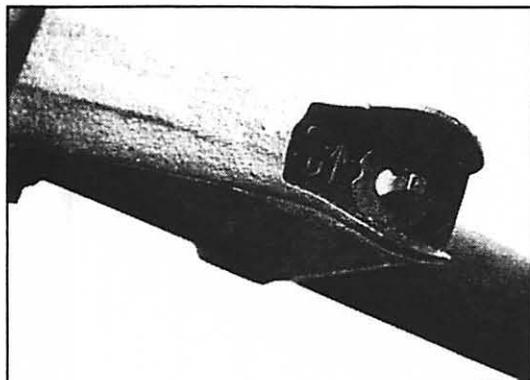
On October 28, 1980, NATO approved the standardization of a second small-caliber cartridge for use within the alliance (STANAG 4172), based on the Belgian SS109 5.56x45mm ammunition. Three different calibers were represented in the NATO trials: the British 4.85mm (never a serious contender), the German caseless 4.7mm (withdrawn because of cook-off problems) and three 5.56mm projectiles (SS109, U.S. M777 and M193 for control).

The SS109 projectile (subsequently adopted by the U.S. Armed Forces as the M855 ball round for the M16A2 rifle and M249 SAW), with its more sharply tapered form (ogive), greater weight (62 grains) and hardened-steel penetrator frontal core, offers armor penetration superior to the M80 7.62x51mm NATO projectile at greater ranges, boring right through the three NATO penetration targets (3.5mm of mild steel plate at 640 meters, and the West German and U.S. steel helmets at 1,150 and 1,300 meters, respectively). As the use of body armor on the battlefield is expected to increase, this looms as an important quality. The improved ballistic stability, which yields greater long-range capability through improved

wind drift performance, has not been offset by any loss in lethality.

There has been a great deal of speculation concerning the effectiveness of the M855 round. Critics have stated that lethality was reduced

In addition to the improved, adjustable 800-meter rear sight, the M16A2 also has a squared front post sight in place of the A1's round front post. The square post was incorporated into the A2 at the request of the Marines, who believe the square post provides a better sight picture.



The rounded handguard halves of the M16A2 are easy to remove due to the use of a tapered slip ring retainer, which existed 20 years ago on the XM177E2.

because a faster (6-groove) rifling (righthand) twist of one turn in 7 inches (1:7 inches) was required to stabilize the M856 tracer round with its much longer Belgian L110 projectile. This same argument was presented when the M16's original barrel twist of 1:14 inches was changed to 1:12 inches. Once again, there is confusion between stability in flight and yawing in living tissue. One does not

necessarily follow as a consequence of the other. In fact, at ranges up to 200 yards and somewhat beyond, the M855 bullet's performance in the human body essentially duplicates that of the older M193 round and actually produces slightly increased fragmentation. It is true that firing M855 ammunition in M16 rifles with a barrel twist of 1:12 inches will result in severe yawing (or "key-holing") in flight—to such an extent that at even very close ranges, the weapon's accuracy potential is reduced to unacceptable levels.

PIP TIME

By 1978, it had become apparent to all that most of the M16A1 rifles in the U.S. inventory had been worn out from use as training weapons. Many had been fired more than 50,000 times. The need was urgent and immediate. Something was required to bridge the supposed 20-year gap when the millennium would commence with something as wonderful as a fully perfected HK G11 with its 4.7mm caseless ammunition. Enter the M16 PIP

(Product Improved Program). A joint venture between Colt, the Marine Corps and the Army commenced in 1979. Within nine months Colt submitted its first proposal on the improved rifle. The M16A2 was approved for service use by the USMC in September 1982. It was type classified (adopted) by the U.S. Army in November 1982. The first 1,500 rifles were delivered to the USMC Marksmanship Training Unit (MTU) in Quantico, Virginia, in January 1984. Major deliveries

to the U.S. Army started by mid-1985. Canada adopted the M16A2 to replace its aging 7.62x51mm Commonwealth FALs. The 81,500 Canadian M16A2 rifles were to be manufactured by Diemaco, Inc., in Kitchener, Ontario, with full-auto instead of three-shot burst.

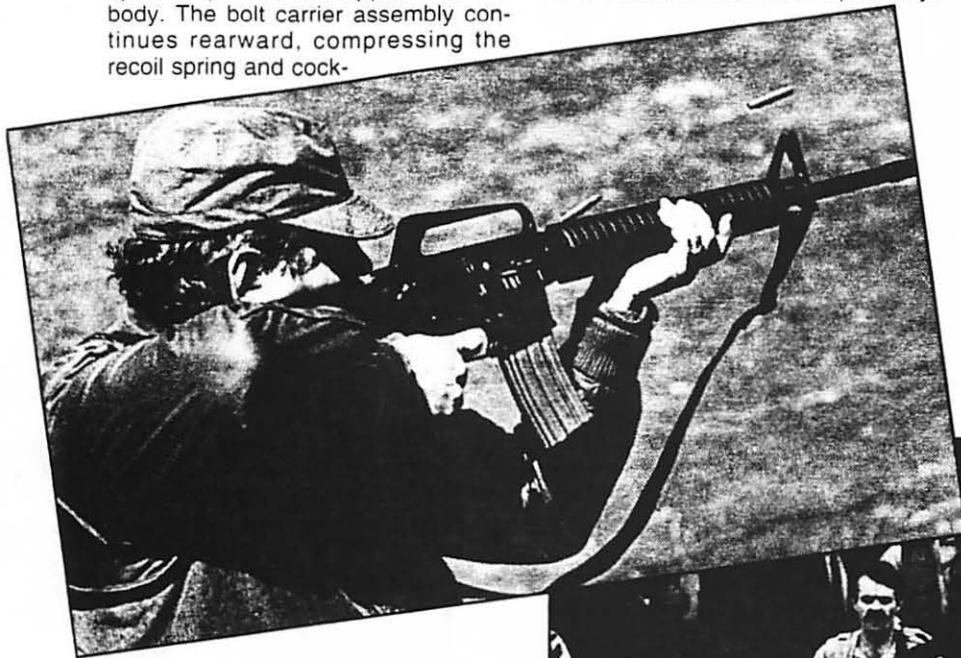
METHOD OF OPERATION

The M16A2 rifle retained the same method of operation as its predecessor. After firing a round, the projectile passes the gas port, permitting gas to flow back through a stainless steel tube and a so-called bolt carrier "key" into the hollow interior of the bolt carrier. As the carrier moves rearward, a cam slot cut into the carrier turns the bolt's cam pin, which causes the bolt

COLTS M16

to rotate clockwise, freeing the seven locking lugs from their abutments in the barrel extension. The carrier's momentum draws the bolt rearward at a slightly reduced velocity. There is no primary extraction and the extractor withdraws the cartridge from the chamber. The spring-loaded "bump" ejector emerges from the left of the bolt face and rotates the empty case, after it has cleared the chamber, around the extractor claw and out the ejection port of the upper receiver body. The bolt carrier assembly continues rearward, compressing the recoil spring and cock-

ifications were incorporated into the M16A2 rifle. The M16A1's famous "bird cage" flash suppressor remains sans the sixth port on the bottom, which was deleted to slightly reduce muzzle climb during burst-fire and diminish position disclosure when firing from the prone in desert climates. There was no change in the flash characteristics (still largely a function of the propellant). The lock washer used to retain the muzzle device was replaced by a set of peel-washers so that the flash suppressor can be rotated either to the right or the left for right or left-handed shooters, respectively.



Much of the present controversy surrounding the M16A2 centers on its three-shot burst mechanism. Many believe it will make an improvement in fire discipline, while others argue it adversely affects the rifle's semi-auto trigger pull.

ing the hammer. The buffer and recoil spring return the carrier, and a fresh round is stripped from the magazine. All forward bolt motion stops after the round is chambered. The carrier continues forward to contact the rear face of the barrel extension and its cam slot turns the cam pin, which rotates the bolt and its lugs anti-clockwise into the locked position. The principle of direct gas action without a piston was taken from the Swedish Ljungman AG42 rifle and the French MAS 44 (the subject of extensive tests at Aberdeen Proving Ground in 1950), 49 and 49/56 series rifles. The M16's trigger mechanism is based on that of the M1 Garand.

NEEDED IMPROVEMENTS

A significant number of needed mod-

The visible portion of the barrel is now much thicker (0.73 inch in diameter). It tapers back to the old diameter just under the handguards past the gas port. While many will assume this was done to improve handling characteristics and/or accuracy potential, the real reason is a reflection of grunt mentality. Too many snuffies were

using the M16 as a crowbar and bending the barrel just forward of the front sight. Three ounces of additional weight has stiffened the barrel by a factor of two to three times.

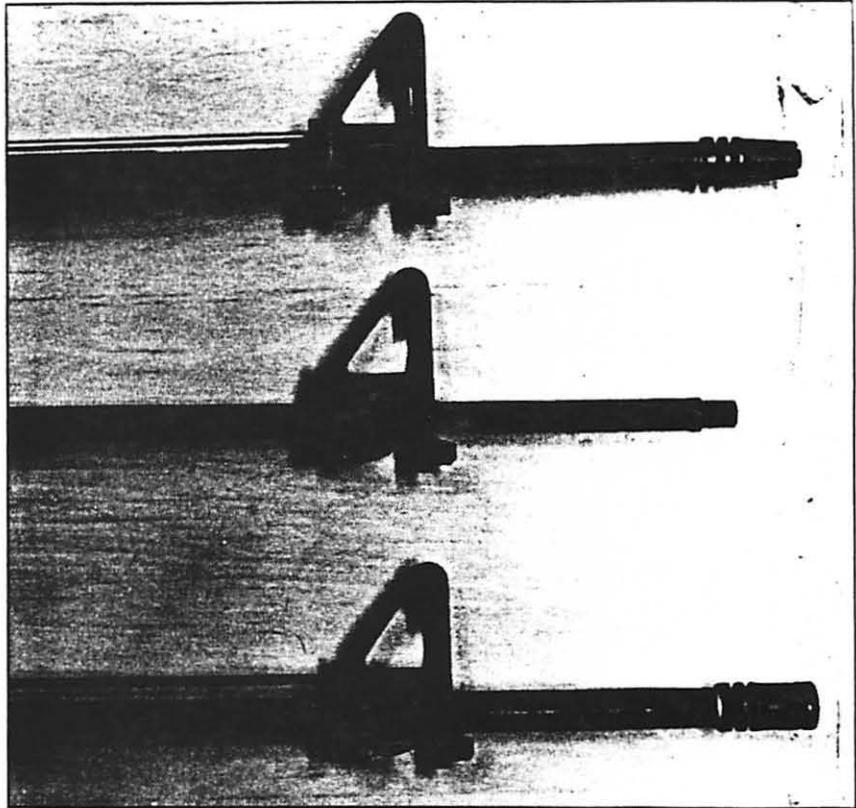
The new handguards resemble those of the M16A1 carbine and Commando models and early factory literature depicting both the M16 rifle and the Colt HBAR. As the upper and lower halves are identical, spare parts inventories were reduced accordingly. They are decidedly more comfortable than the previous triangular-shaped handguards. The improved handguards and heavier barrel have increased the rifle's sustained fire capability as the cook-off factor has been increased by 20 rounds to a total of 160 rounds. The handguards are retained by a tapered slip ring, which was already in the system 25 years ago on the XM177E2. The pistol grip now has deep longitudinal grooves along its rear face and a finger swell 1 inch below the trigger-guard. The front-sight post is square and adjusted only for initial zero, which is now done at the factory. This change was requested by the Marine Corps who perceived it to offer an improved sight picture.



The special operators who handled Gen. Schwarzkopf's security during the Gulf War were armed with the new M16A2 M4 carbines fitted with Aimpoint 3000 electronic dot sights.

The new rear sight was also requested by the Marines who first saw it on the old M16 light machine

M16 barrel profiles, top to bottom, include the original M16 HBAR, the standard M16A1 barrel and the new tapered barrel of the A2 variant. The A2 barrel was thickened at the muzzle, not to improve stability or accuracy, but to strengthen it to avoid bending when the tube was used by GIs as a pry bar!



gun. It is a flip-type peep sight with two apertures calibrated for M855 ammunition. When flipped forward, the large aperture (0.197 inch in diameter), marked "0-2", is brought into view for ranges out to 200 meters, low-light levels or moving targets. When firing within this range, the elevation knob should be set to "3/8" with the sight base at its lowest position. When flipped back, the peep sight brings the small aperture (0.070 inch in diameter) into view for ranges of 300 to 800 meters. A small indicator line matches up with the windage calibration lines on the back of the sight base. One audible click of the windage knob moves the sight one-half minute right or left. With the small aperture in use, the elevation knob should be set at the range required: "3/8" low for 300m, "4" for 400m, "5" for 500m, "7" for 700m and "3/8" high for 800m. Audible clicks between the main settings will raise or lower the elevation by 1 minute of angle. The new M16A2 rear sight is easily adjusted—perhaps too easily, as grunts have a tendency to twist and turn anything that moves.

The M16A2 upper receiver casting has also incorporated a case deflector to the rear of the ejection port,

which throws empty cases clear of left-handed shooters. In semi-automatic fire, the ejection pattern has been altered 5 to 6 degrees forward by this deflection hump. The spring-loaded retaining catch on the ejection port's dust cover has been strengthened and enlarged.

The forward bolt assist was changed from a casting to a screw machine component with a button-like

shape and concentric rings. I have never once personally used or observed anyone using the forward bolt assist in a battlefield environment. When I inquired of Colt officials why this feature was retained, I was informed that no one requested its removal.

A most discussed feature of the M16A2 is the three-shot burst control consisting of a simple and durable ratchet with an overrunning clutch. Each cycle of the hammer turns the spring 60 degrees until after 180 degrees the hammer falls from the auto sear to the trigger sear, holding it in place. The nine-component mechanism is of the interrupted type, which means it picks up the count wherever it left off. Thus, the first burst may be either one, two or three rounds.

This system is less complex and uses fewer components than the intricate ratchet-counting device fitted to Heckler & Koch weapons. The HK burst control holds the sear off the hammer until the allotted number of rounds have been fired; any interruption (such as an empty magazine) starts a new count and releasing the trigger resets the counter.

According to the author, the M16A1 served admirably in the Vietnam War, and the stories regarding its poor functional performance and the deficiencies of its 5.56mm bullet are greatly exaggerated.



The M16A2 three-shot burst control requires a heavier disconnecter and springs. Thus, the trigger pull-weight is about 1 pound heavier. Because of the burst control's rotating cam, trigger pull-weight in semi-automatic fire will increase with each pull until the three-stage cycle is completed. Most of those that I have measured start with a relatively drag-free pull of about 7.5 pounds at stage one and end with

markings remain as before, on the left side of the lower receiver, except the "AUTO" position has been replaced by "BURST." The human engineering here is superb and far superior to the Kalashnikov. The selector can be manipulated easily by the thumb of the firing hand without shifting the firing grip. The selector markings "SAFE," "SEMI" and "BURST" are stamped on the right of the receiver.

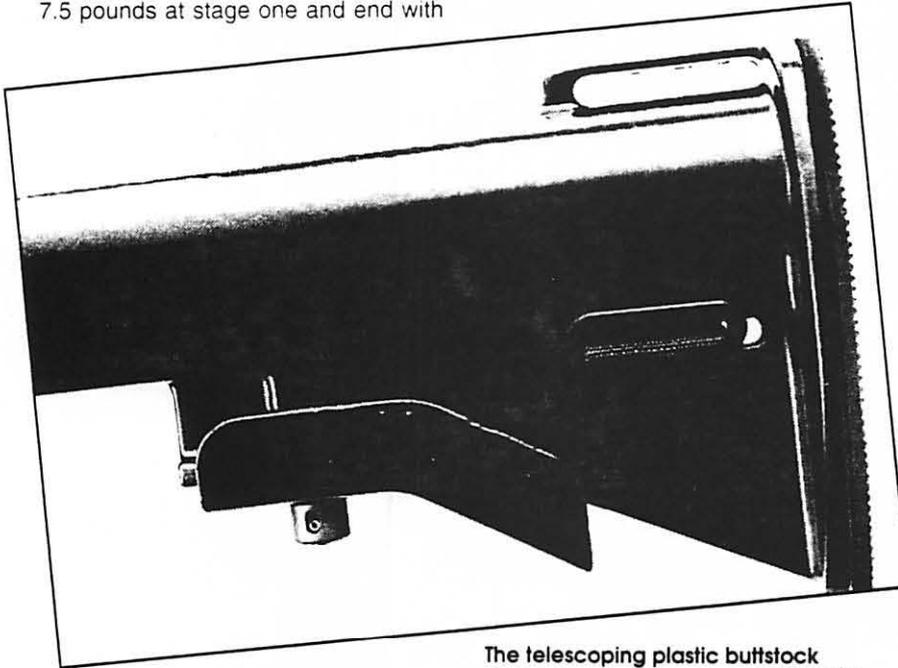
The trigger-pull length has been changed to a dimension

determined to be ideal by the Human Engineering Laboratory at Aberdeen Proving Ground. The lower receiver casting has been subtly altered and strengthened in the rear to accommodate the stronger buttstock—fabricated from foam-filled high-impact plastic designed to resist fracture from rifle grenade launching (trendy once again with development of the bullet-trap types) and buttstroking Parris Island training dummies. The buttstock has been lengthened by $\frac{5}{8}$ inch. The buttplate's edges are no longer rounded and the entire surface, not just the butt-trap, is deeply checkered to reduce slippage.

COMPARISON WITH THE AK

The weight trade-off for the above modifications is a modest increase from 7 pounds empty (M16A1—early M16s without buttplate trap or forward bolt assist weighed only 6.7 pounds), to 7.5 pounds (the AKM weighs about 6.9 pounds empty). Overall length of the M16A2 is 39.5 inches with a barrel length of 20 inches. All well and good, but what about performance: reliability, durability, accuracy and hit potential, handling characteristics and semi-hysterical claims of accelerated bore erosion?

Provided it is maintained properly, the M16A2 is almost every bit as reliable as its main competitor—the Kalashnikov. But let's give the AK a slight edge in this area. The M16A2 is no more or less durable than the AKM—each is capable of 50,000 rounds of service life or more. In my experience, the CAR-15-type retractable stock will outlast and provide a more stable firing platform than the AK downfolder stock. Most M16A2s



The telescoping plastic buttstock design used on the newest M16A2 M4 carbine is identical to that designed by Colt during the "shorty" program dating to 1966.

9 pounds at stage three. While this may twitch the ultra-sensitive trigger fingers of match shooters, it will not be noticed in the heat of combat.

Experienced operators do not need a three-shot burst control device to deliver accurate and consistent two-shot bursts from the M16, which has a cyclic rate from 700 to 900 rpm. Unfortunately, largely as a consequence of the current levels of training in the U.S. military, the average soldier will, under the stress of combat, flip the lever to "rock n' roll" and go "cyclic," holding back on the trigger until he has dumped the entire 30-round magazine downrange. Under those circumstances, a three-shot burst mechanism is preferable to full-auto as he must at least jerk the trigger ten times to empty the magazine.

The selector lever location and

When it comes to assault rifles chambering the 5.56x45mm NATO cartridge, the Colt M16 is dominant around the globe. Here an Israeli infantry officer carries one of the shorty A1 carbines, while his RTO (radio telephone operator) is armed with the Gillon SAR.



Colt's M203 grenade launcher, shown here mounted to the latest A2 rifle and to an earlier Air Force A1 in the inset, was adopted by the Army in 1969. It fires 40mm HE, AP and various signaling grenades, and features a sliding breech mechanism.

will shoot to 2 MOA without any modification. You'd have a match-grade Kalashnikov if it shot better than 6 MOA. Hit potential is to a great extent a function of operator experience and either system will perform adequately with the issue sights at ranges under 300 meters. With regard to handling characteristics, the M16A2 wins hands down over the AK. In 1984 I conducted a 6,000-round firing test of the M16A2 that clearly demon-



strated that the new 1:7-inch twist rifling did not increase bore erosion. Perceived recoil is moderate and marginally less than the AK.

Both the M16 and Kalashnikov feature iron sights placed well above the bore's axis (about 3.5 inches on the M16 and approximately 2 inches on most AKs). At close ranges, operators must learn to aim for the top of the head in order to strike the brain cavity.

During the limited ground fighting of Desert Storm, the M16A2 held its own against the AK. Both were decidedly superior to the woeful British SA80. However, be advised that arid region environments will play havoc with any small arms system. When they overran Iraqi defensive bunkers, U.S. Marines encountered AK magazines so clogged with sand grains that the followers were jammed halfway up the magazine bodies. In high sand/dust environments, small arms need to be disassembled and cleaned more frequently. If possible, they should be cased and remain covered until contact is anticipated. This is more important than the type of lubricant selected.

MANUFACTURERS AND CLONES

Following the joint Army/Marine Corps product improvement of the M16A1 of the late '70s and early '80s, the Colt M16A2 was adopted. Here, a Colt executive presents the new A2s to both Marine and Army officials.

While Colt subsequently manufactured more than 9 million M16s, others have been, and presently are, involved in the production of AR-15/M16 rifles. During the Vietnam War, both GMC's Hydramatic Division and Harrington & Richardson were awarded second-source production contracts. South Korea manufactured, under license, an M16A1 known as the model 603-K. During

the late 1960s, the Elisco Tool Company of Manila, Republic of the Philippines, manufactured M16A1 rifles and carbines under license from Colt, as did Chartered Industries of Singapore. Norinco of the People's Republic of China has manufactured an unauthorized M16 clone known as the "CQ" (a transliteration of the number "16") 5.56mm Automatic Rifle.

Currently, both Colt and FN Manufacturing Inc. in Columbia, South Carolina, manufacture the M16A2 model known as the C7



COLTS M16

(unrestricted full-auto instead of three-shot burst control) for the Canadian Armed Forces. Semi-automatic-only and selective-fire versions of the AR-15/M16 series have also been made in the U.S. by Springfield Armory Inc. of Geneseo, Illinois; Olympic Arms Inc. of Olympia, Washington; Eagle Arms Inc. of Coal Valley, Illinois; and Quality Parts Company/Bushmaster Firearms Inc. (QPC/BFI) of Windham, Maine.

Most of the semi-automatic-only versions of the AR-15/M16 duplicate the selective-fire models except for the bolt carriers and trigger components required for full-auto fire. Colt's latest semi-auto "Sporter" version has no bayonet lug (How many crimes are committed at bayonet point?) and is issued with a 20-round magazine permanently blocked to accept only five rounds.

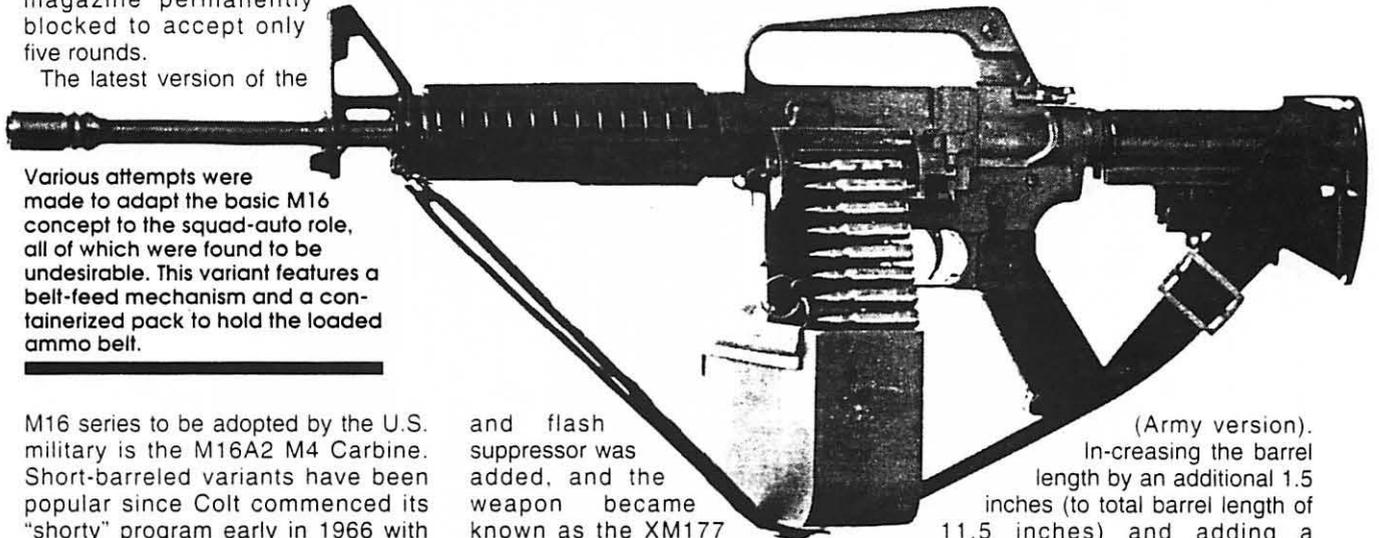
The latest version of the

Various attempts were made to adapt the basic M16 concept to the squad-auto role, all of which were found to be undesirable. This variant features a belt-feed mechanism and a containerized pack to hold the loaded ammo belt.

M16 series to be adopted by the U.S. military is the M16A2 M4 Carbine. Short-barreled variants have been popular since Colt commenced its "shorty" program early in 1966 with the CAR-15 (also known as the "Commando" or Model 609). A noise



Today the M16 rifle is second only to the Kalashnikov in use with foreign forces. Here members of the Christian Lebanese militia are shown with M16 rifles, most probably provided by their Israeli allies.



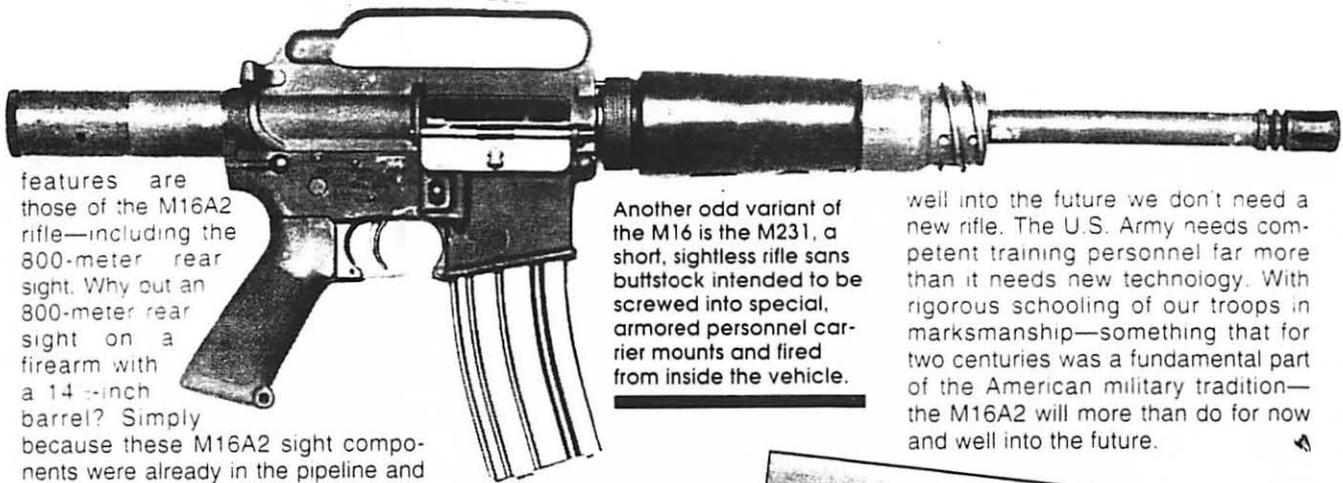
and flash suppressor was added, and the weapon became known as the XM177 (Air Force version without forward bolt assist) and XM177E1

(Army version). Increasing the barrel length by an additional 1.5 inches (to total barrel length of 11.5 inches) and adding a redesigned noise and flash suppressor led to the XM177E2. The SEALs had their Stoners, but U.S. Army Special Forces personnel wrecked havoc with the CAR-15.

The M4's 14½-inch barrel is stepped to accept the M203 40mm grenade launcher. Its handguards are those designed for the shorty series in 1966—as is its telescoping buttstock. In all other regards its

In the Gulf War, U.S. troops were armed with both M16A1 and M16A2 rifles due to a shortage of the newer, product-improved M2 variants.





features are those of the M16A2 rifle—including the 800-meter rear sight. Why put an 800-meter rear sight on a firearm with a 14 1/2-inch barrel? Simply because these M16A2 sight components were already in the pipeline and this further increases commonality of parts and reduces the maintenance load. After the initial elevation zero has been adjusted by means of the front sight post, flip the large, rear aperture (marked "0-2") forward, set the elevation knob to "3" with the sight base at the lowest position and you're ready to empty the M4 Carbine at the ranges at which it will be most effective: well under 200 meters.

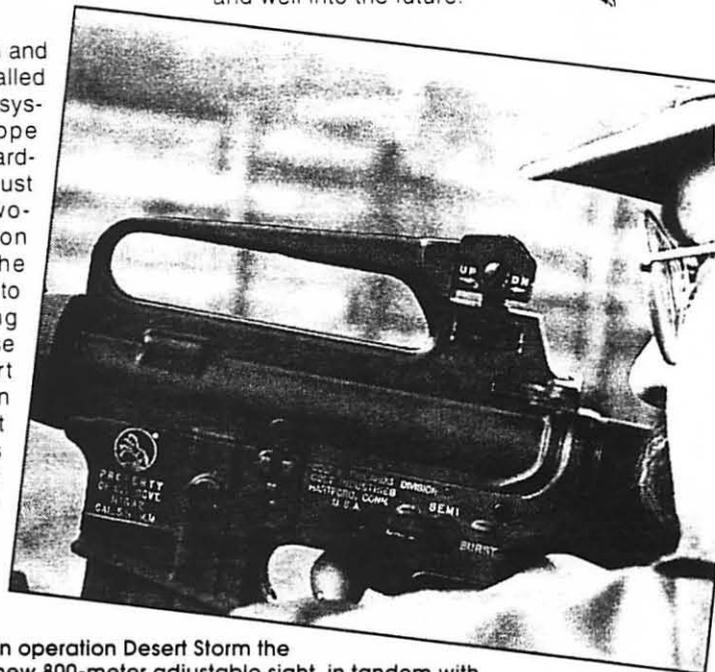
The latest controversy to swirl around the M16 involves the adoption of an optical sight. Prevailing forces in the U.S. Army are poised to remove the carrying handle and install a scope in hope of improving hit probability. This would be, in my opinion, a serious mistake. The vast majority of enemy contacts—no matter what the terrain or vegetation—take place at distances under 100 meters. At this distance and less, scopes of four-power magnification and higher provide such a restricted field of view that target acquisition times are significantly increased. Scopes of four-power

Another odd variant of the M16 is the M231, a short, sightless rifle sans buttstock intended to be screwed into special, armored personnel carrier mounts and fired from inside the vehicle.

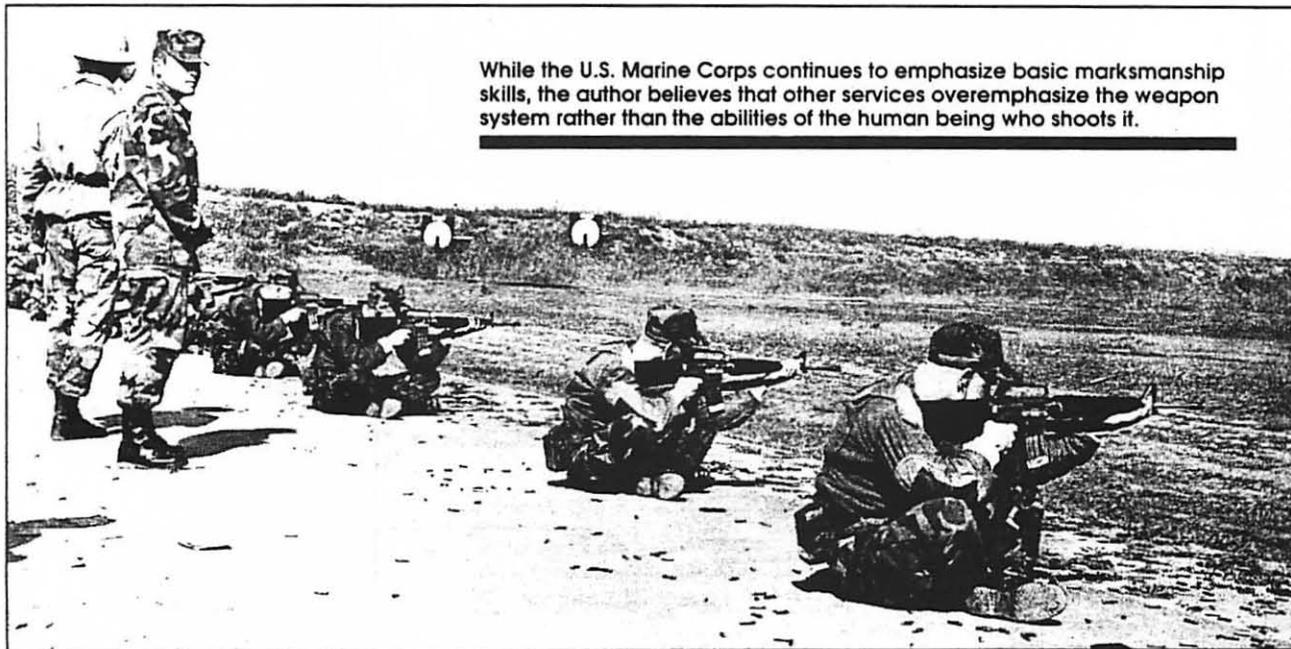
well into the future we don't need a new rifle. The U.S. Army needs competent training personnel far more than it needs new technology. With rigorous schooling of our troops in marksmanship—something that for two centuries was a fundamental part of the American military tradition—the M16A2 will more than do for now and well into the future.

magnification and more should be installed on dedicated sniper systems only. Any scope mounted on a standard-issue infantry rifle must be of less than two-power magnification (such as that of the Austrian Steyr AUG) to avoid compromising the soldier's response time. During Desert Storm, it has been documented that some British troops discarded the 4X SUSAT optical sight on the dreadful SA80 bullpup in favor of the crude emergency iron sights.

There is nothing wrong with the M16A2 or its ammunition. At the present time and



In operation Desert Storm the new 800-meter adjustable sight, in tandem with the M855 load, proved very popular with troops engaging long-range targets.



While the U.S. Marine Corps continues to emphasize basic marksmanship skills, the author believes that other services overemphasize the weapon system rather than the abilities of the human being who shoots it.



APPENDIX C:

Article:

"Update: Assault Rifle Ammo" by Kevin E. Steele

From

Assault Rifles, Vol. 10, No. 2., New York, 1992.

TODAY'S COMBAT
AMMO IS FAR FROM
EQUAL, WITH THE U.S.
LEADING THE WAY.
By Kevin E. Steele

By their very definition, assault rifles are designed for use with "intermediate" cartridges, a term that can now be considered obsolete, easily replaced by "assault-rifle" cartridges. However, originally the term "intermediate" was meant to differentiate between accepted pistol ammunition used by submachine guns (ie: 9mm, .45

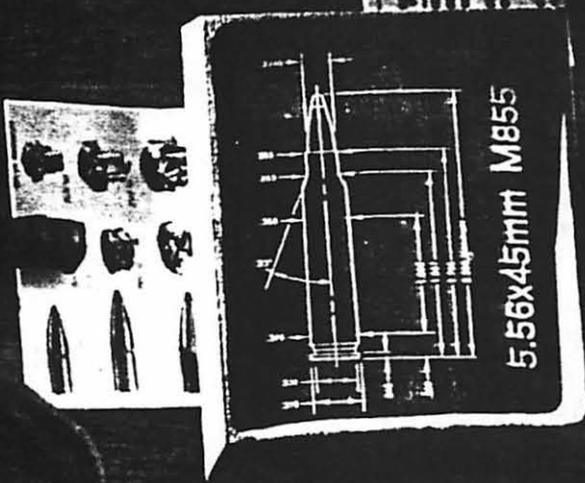
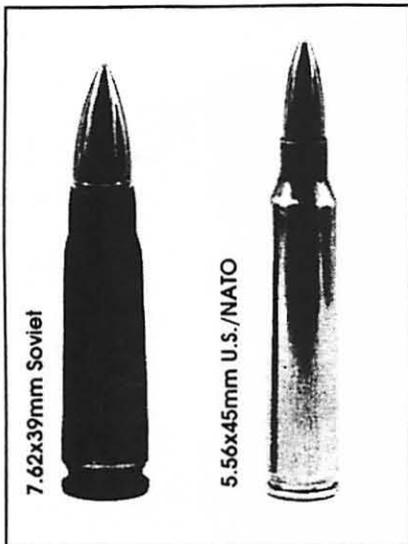


ILLUSTRATION BY ALAN EVANS

ASSAULT RIFLE AMMO



Today's two most prolific assault-rifle cartridges are the Soviet-designed 7.62x39mm and the U.S./NATO 5.56x45mm rounds. Almost all of today's assault-rifle designs chamber one of these cartridges.

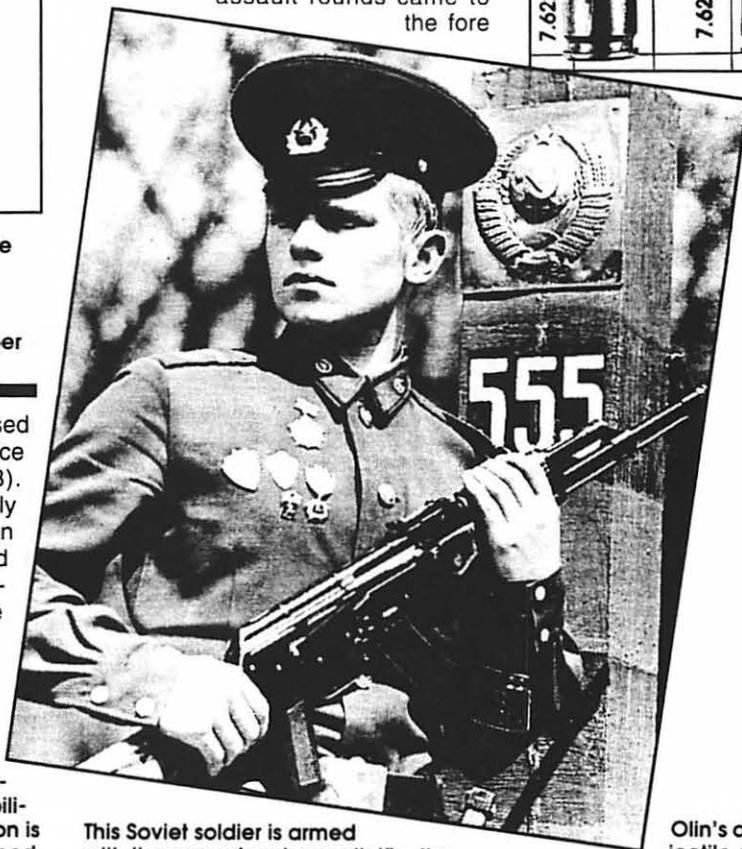
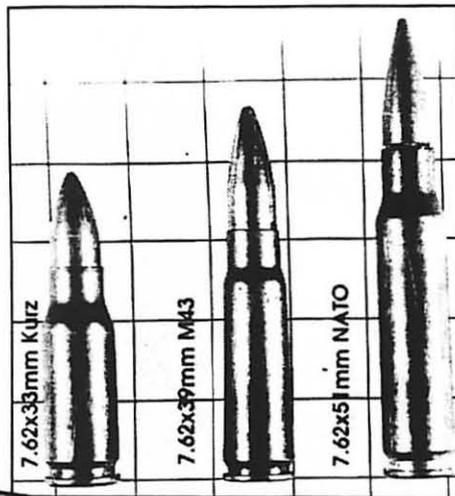
ACP) and the full-power loads used by semi-auto and bolt-action service rifles (ie: .30-06, 7.92x57, .303). This definition was set in the early 1940s, and the German 7.62x33mm Kurz is recognized universally as being the first "intermediate cartridge" and thus the first true *assault rifle* cartridge.

In the two decades from 1943 to 1963, no fewer than ten assault rifle cartridges came into various stages of exis-

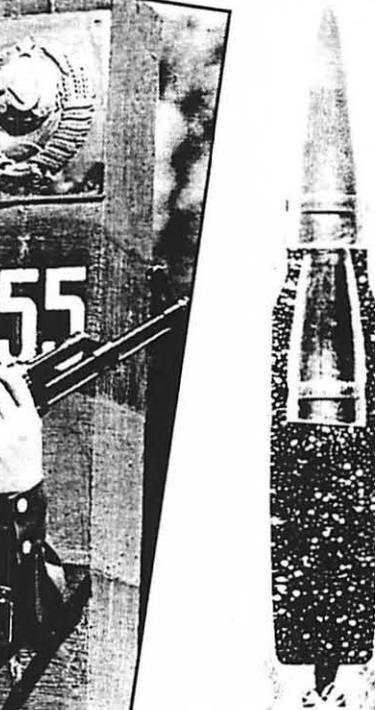
Recent assault-rifle ammo developments call for increasing hit probability. One concept under consideration is a duplex projectile cartridge designed by the Olin Corporation, which launches two bullets simultaneously from a single cartridge case.

These rounds illustrate the early evolution of assault-rifle cartridges, from the German 7.62x33mm Kurz at left, to the Soviet 7.62x39mm M43 in the center, to the U.S. 7.62x51mm NATO at right. Technically, the 7.62mm NATO is actually a "battle rifle" rather than a true "intermediate" assault-rifle cartridge.

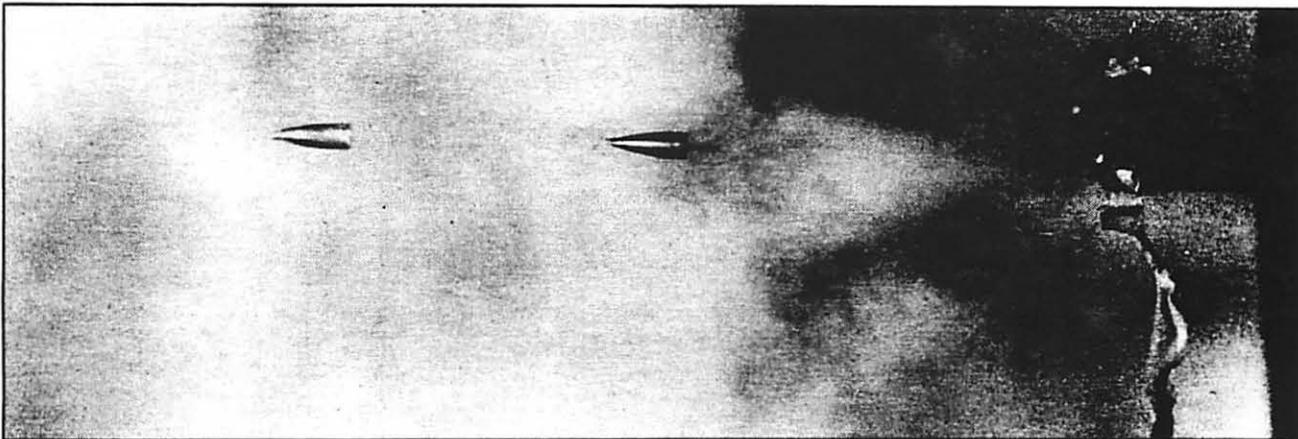
tence. Among them were such oddities as the .280/30 British (circa 1945), Spanish 7.92x40.4mm (circa 1948) and the Czech 7.62x45mm (circa 1950). However, amid this mishmash of design effort, two assault rounds came to the fore



This Soviet soldier is armed with the preeminent assault rifle, the AKM, chambering one of two predominant assault rifle cartridges—the 7.62x39mm M43 round.



Olin's duplex or twin projectile cartridge, this one in 7.62x51mm NATO, is shown in cut-away, showing the piggyback position of the bullets within the cartridge case.





Arguably the most prolific assault-rifle cartridge is the 7.62x39mm M43 round of the Soviets. This case of M43 ammo was captured during the invasion of Grenada. Note the deceptive labeling on the lid, proclaiming the contents to be from the "Cuban Economic Office."

that continue to hold the lion's share of worldwide acceptance—the Russian 7.62x39 M43 and American 5.56x45mm NATO cartridges.

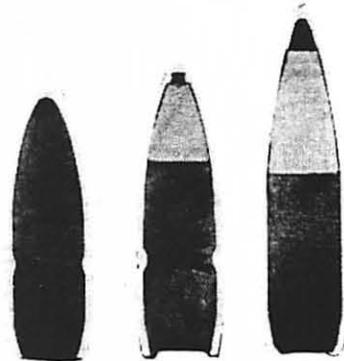
The Soviet 7.62x39mm cartridge was very similar to the original German 7.62x33mm Kurz round. In fact, controversy continues to this day as to whether or not the concept originated in Germany or the Soviet Union. Needless to say, the German

round appeared first, in 1941, followed by the Soviet round in 1943. Like the Germans, World War II tactics had taught the Russians that massed, individual firepower proved more effective on the modern battle-

If it can be said that two assault-rifle cartridges predominate the military scene, then these two assault rifles account for the popularity of both rounds. The Colt M16, seen here in its improved A2 variant, chambers the 5.56x45mm NATO SS109/M855 cartridge. The Soviet AK47, chambering the 7.62x39mm M43 cartridge, is shown here in its Red Chinese Type 56 variant, distinguishable by its unique underbarrel folding spike bayonet.

field than did deliberately aimed, long-range riflery. However, while the Soviet's did indeed issue large numbers of submachine guns to their troops, (as did the Germans) they were cognizant of the limitations imposed by the submachine gun's cartridge. What was needed was a new breed of cartridge that permitted controllable full-automatic firepower in tandem with greater effective range and increased penetration capability.

With these design parameters in mind, two Soviet engineers, N.M. Elizarov and B.V. Semin, set out to design a new "intermediate" cartridge. The result of their efforts was the 7.62x39mm round, designated M43; in effect a shortened, rimless version of the standard 7.62x54R Nagant round. The body of the M43 case is also



To increase the penetration abilities of 5.56mm projectiles, hardened steel inserts have been incorporated into their jacketed bullet designs. These rounds, from left to right, include the original M193 bullet without a steel insert, the experimental (not adopted) XM777 U.S. projectile and the recently adopted SS109/M855 projectile. Both the XM777 and SS109/M855 bullets incorporate steel inserts.



ASSAULT RIFLE AMMO

reduced somewhat, making reforming from Nagant brass highly difficult. The new M43 round was $\frac{1}{4}$ -inch longer (6mm) than the German Kurz cartridge, and it propelled a 123-grain jacketed bullet to a velocity of 2,330 feet per second. While the 7.62x39mm round first made an appearance chambered within a semi-automatic carbine (the SKS), it was the selective-fire *Avtomat Kalashnikova* assault rifle of 1947 that introduced the M43 cartridge to its destiny.

Likewise, the U.S. 5.56x45mm cartridge and the M16 rifle are viewed as common developments. Initiated by the Armalite Corporation for use in their AR15 rifle, which was intended to replace the M1 carbine by the U.S. Air Force, the 5.56x45mm cartridge was based on the .222 Remington, although it is almost identical to Remington's .222 Magnum, which was a concurrent development. Credit for the 5.56/.223 goes to *Guns & Ammo* technical editor, Robert Hutton, who was asked by Eugene Stoner to develop a new cartridge capable of launching a 55-



the .222 Remington until it reached the desired results—3,320 fps muzzle velocity—teamed to 55,000 psi pressure. He then went on to theorize that a proper cartridge case for this load should be capable of holding an additional 2 grains of powder

These Canadian infantrymen are armed with the latest NATO small arms, the M16A2 rifle and the FN Minimi belt-fed squad automatic. Both weapons are chambered for the heavy 62-grain bullet, SS109/M855 5.56x45mm NATO assault-rifle cartridge.



20 CARTRIDGES

5.56 MM

BALL M193

LOT FC 1802

FEDERAL CARTRIDGE CORPORATION

The M193 5.56x45mm ammo was developed for the original M16/M16A1 rifles, which featured a one in 12-inch twist barrel intended to stabilize the M193's 55-grain projectile.

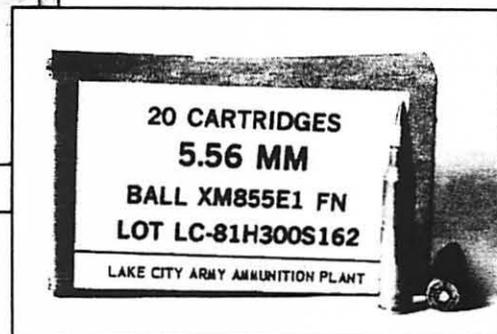
cartridge, this round became the standard chambering not only in Simonov's SKS, but in Degtarev's RPD light machine gun and eventually the entire Kalashnikov "family" of weapons to include the AK47/AKM assault rifles and their Warsaw Pact and Chinese clones, along with Kalashnikov's complementary RPK light machine gun. The basic M43 ball

grain bullet at enough muzzle velocity so that its retained velocity at 500 meters would equal that of the speed of sound (1,100 fps).

Accepting Stoner's challenge, Hutton prepared a special Remington Model 722 rifle chambered in .222 Remington, but beefed up with an Apex pressure barrel. In effect, Hutton then proceeded to overload

over the existing .222 Remington case, which could be produced by extending the length of the .222 case $\frac{1}{4}$ -inch, while incorporating a shorter neck as the shoulder was moved forward as far as possible. This did the trick, and the outcome is today's 5.56x45mm NATO cartridge.

Returning to the 7.62x39mm Soviet



20 CARTRIDGES

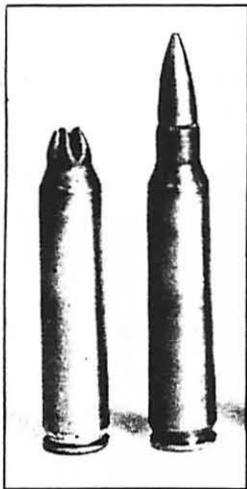
5.56 MM

BALL XM855E1 FN

LOT LC-81H300S162

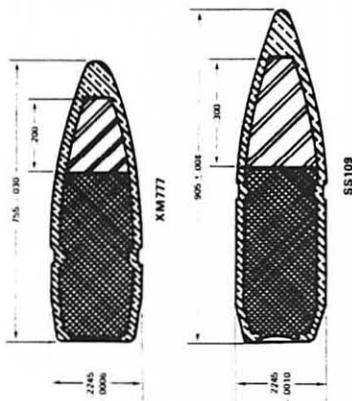
LAKE CITY ARMY AMMUNITION PLANT

Current U.S.-issued ammunition for the one in 7-inch twist M16A2 rifle is the M855 ammo shown here. It is distinguished from the earlier M193 ammo by its green tip.



This photo shows the M193 5.56x45mm NATO load, at right, next to its crimped blank variant, the M200.

loading holds a 123-grain, gilding metal-jacketed, boattailed bullet featuring a mild steel core. This is designated the Type PS. The Type 45 tracer round features a green tip; Type BZ is an armor-piercing/incendiary cartridge marked with a black tip; the Type ZP is an incendiary round marked with a red tip. In addition, there are also tracer practice rounds featuring a plastic core, white tip and



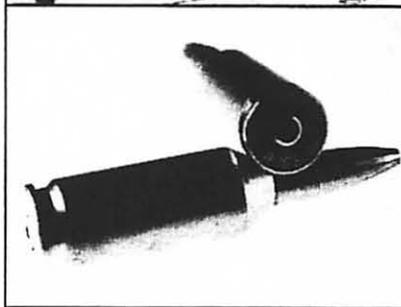
These mechanical drawings show the dimensional differences between the experimental XM777 bullet and the adopted SS109 projectile. Note that both feature full metal jackets, boat-tails, lead cores and hardened steel inserts for improved penetration ability.

green collar—a full-length crimped blank and a shortened blank used to fire rifle grenades. M43 cases are manufactured from both brass and steel, although the steel cases are the most common, featuring either a thin copper plating or a green or brown lacquer finish.

Meanwhile, during the almost 30 years since its acceptance as the standard U.S. military rifle cartridge followed by NATO, the 5.56x45mm has seen almost universal adoption by most countries outside the



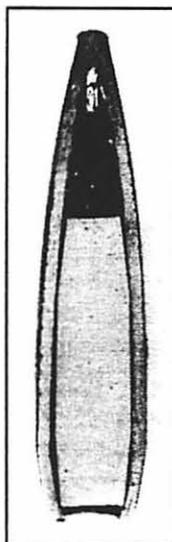
The late Robert Hutton, one-time technical editor for *Guns & Ammo*, is recognized as the father of the 5.56x45mm assault-rifle cartridge, designed originally for the Armalite AR15 rifle, which eventually became the M16.



The recent 5.45x39mm Soviet assault-rifle cartridge, chambered in the AK74 rifles, is based on the Soviet Olympic shooting round, the .220 Russian shown here, which in turn was based on the M43 7.62x39mm intermediate cartridge.

Soviet/Chinese sphere of influence. Rifles chambering this round include, but are not restricted to, the U.S. M16, British L85A1, Israeli Galil, South African R4, Swiss SIG SG541,

The bullet used by the Soviets in the 5.45x39mm cartridge has a diameter of .221-inch, a very sharp spitzer shape, good sectional density, full metal jacket and the reverse of the SS109/M855 design—a hardened steel core and a lead filler insert. Also, note the unique air pocket at the tip, just ahead of the lead filler element. This bullet tends to be nose heavy and tumbles violently upon impact, creating massive wounds.



Italian Beretta AR70, French FAMAS, Austrian Steyr AUG, German HK G33/43, Belgian FN FNC, and the American AR18, Ruger Mini 14 and Stoner 63 rifles.

As originally offered, the 5.56x45 U.S./NATO used a full-metal-jacket, lead-cored 55-grain boattail bullet designated as the M193 load. Special purpose variants of this cartridge include the M195, which is a crimped, grenade launching round; the M196, a red-tipped tracer; the M197 proof cartridge; M199 fluted dummy cartridge with an empty primer pocket; the M200 crimped blank; and the M755, a special purpose round designed to launch the M243 anti-riot grenade.

In the 1970s, the U.S. and NATO developed a requirement for a reduced-size squad automatic weapon to replace existing general purpose machine guns chambering the 7.62x51mm cartridge. While the idea of a mid-size round between the 5.56 and 7.62 offerings was considered for a short time, it seemed no one really wanted to add a third standard cartridge to the logistics train. However, in order for the 5.56x45mm to be practical in a squad auto, its long-range accuracy potential had to be improved, along with its long-range penetration capabilities, particularly against ballistic helmets and

body armor.

The outcome of these deliberations resulted in the SS109/M855 class of 5.56x45mm cartridges. Using a longer, heavier 62-grain boat-tail bullet incorporating a hardened steel penetrator element teamed to a lead core, the new SS109/M855 bullets proved themselves superior to the M193 projectile, both in long-range accuracy and penetration. In fact, tests showed that the SS109/M855 provided better penetration than the FMJ M80 7.62 ball load.

However the longer, heavier bullet of the SS109/M855 load required an increase in rifling twist over the one in 12-inch rate used in existing rifles chambering the 5.56x45mm cartridge. This resulted in just one of the changes made to the U.S. M16A1 to produce the updated M16A2 rifles. Luckily, lethality was also increased on human targets, despite the fact that the faster twist helped stabilize the new M855 projectile better than the M193 load, which developed its lethality and wounding capabilities due to its instability, which caused it to yaw upon striking a target. It was found that the super-stabilized M855 projectile would fracture at the cannelure upon contact with soft tissue, creating double or multiple wound channels.

NATO-designated SS109 ammunition features a black tip to differentiate it from the earlier SS92 (55-grain bullet) ammo, while the U.S. counterpart M855 load has a green tip in variance to the non-colored projectile of the M193 loading.

At present, the only variant load I am aware of is the M856, which is a

COMPARATIVE BALLISTICS

CARTRIDGE	DESIGNATION	BULLET DIAMETER (in./mm)	BULLET WEIGHT (grs.)	MV (fps)	ME (ft./lbs.)
5.56x45mm NATO	M193	.223	55	3,170	1,227
5.56x45mm NATO	M855	.223	63	3,000	1,259
7.62x39mm Russian	M43	7.62	123	2,330	1,483
5.45x39mm Russian	M74	.221	54	3,000	1,079

tracer round easily distinguished by its red tip.

Concurrent with the development of the improved 5.56x45 load, the Soviets recognized the advantages of the smaller caliber round used by the U.S. and its allies. The Soviet solution was the 5.45x39mm cartridge, created by necking down their 7.62x39 M43 round. Quite similar to the .220 Russian target cartridge used by Soviet Olympic shooters, the new 5.45x39mm cartridge uses a 54-grain bullet that's extremely long, with a sharp spitzer shape, attaining a muzzle velocity of 3,000 fps. The core of the bullet is mild steel, with lead filler toward the front and a curious air space right behind the tip. While the bullet's design creates an excellent sectional density (diameter to length ratio), which enables it to maintain its stability at long range, the positioning of its lead filler forward forces it to tumble upon impact, imparting spectacular wounds as evidenced following its use

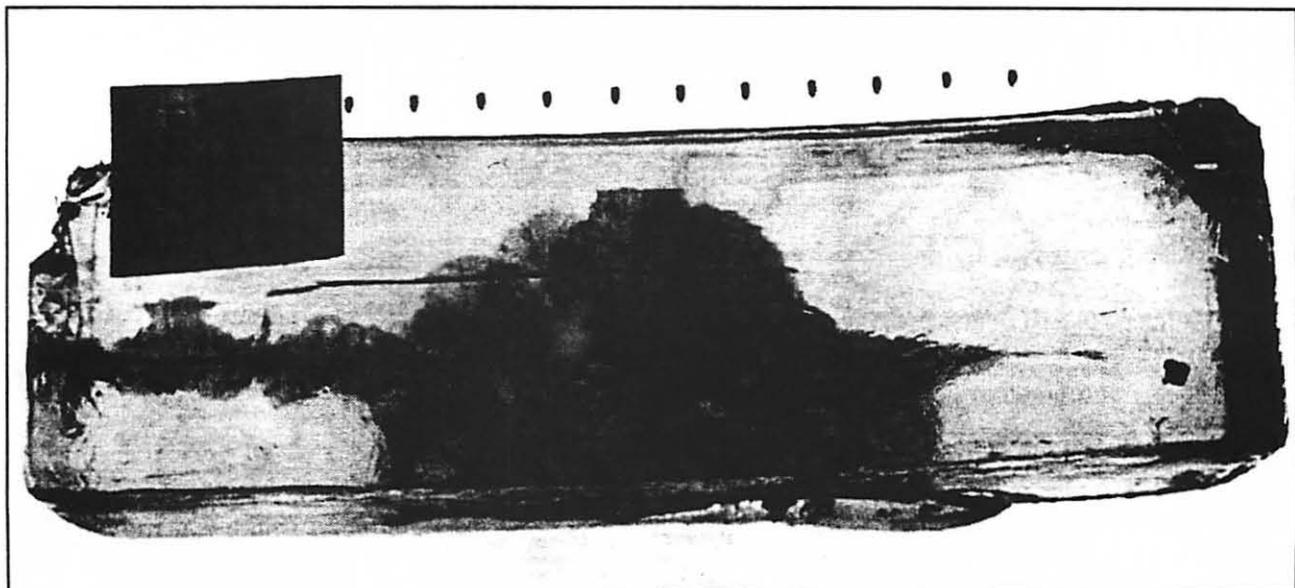
against the Afghan mujahideen.

In point of fact, it can be said that the new 5.45x39mm round is indeed superior to the nearly 50-year-old 7.62x39mm cartridge it was slated to replace. The retained energy of the 54-grain 5.45mm projectile at long range is superior to the 123-grain 7.62mm bullet, and its accuracy potential is also superior. Likewise, the wounding effect of the 5.45mm round is greater than that caused by the 7.62 round, as this bullet tended to overpenetrate on soft tissue targets. However, the Soviet 5.45x39mm is not superior in performance to the new NATO SS109/M855.

The 5.45x39mm cartridge, which began to be fielded in 1974, is chambered in an updated variant of the AKM rifle. This weapon, designated the AK74 (AKS74 with folding stock) is easily identified by its long bulbous flash suppressor and its curved, brick-colored plastic magazine. It appears that only Soviet forces have been armed with the AK74 rifles, and with the collapse of the Soviet Union now evident, the future of the 5.45x39mm cartridge and the rifles for which it is chambered is quite uncertain.

What does the future hold in assault rifle ammunition technology? For those answers, I direct you to the article entitled *Star Wars Rifles of the Future* elsewhere in this magazine.

This block of ballistic gelatin illustrates both the penetration and wound-producing characteristics of the new M855 5.56x45mm NATO projectile. Note the permanent wound cavity is greater in diameter than the caliber of the bullet, along with the massive temporary cavity produced midway along its path through the gelatin.





APPENDIX D:

"Noise Sources"

Extract from:

THE COMPLETE BOOK

of

U.S. SNIPING

by:

Peter R. Senich

(Paladin Press, Boulder, CO, 1988)

COMPILED
BOOK OF
U.S. SMIPING

Peter R. Senich



kills from one ambush position. The suppressor controlled the muzzle flash and noise so well that at no time did the VC actually pinpoint the direction of fire or the location of the ambush site. Field and combat test data indicate that the suppressor does the following:

- A. Eliminates muzzle flash.
- B. Suppresses the muzzle noise considerably and makes it virtually impossible to pinpoint the sniper's position using the "crack" and "thump" method.
- C. Accuracy or range is not affected.
- D. The added weight is of no consequence when the above advantages are considered.

Based on the successes of the 9th Division snipers in the field with the suppressor equipped rifle, the CG, 9th Division, desired to have at least one suppressor for each two man sniper team. It is recommended that the noise suppressor be furnished as an integral part of the sniper weapons system.

Additional test firings conducted with modified 7.62mm subsonic ammunition, although quiet, were found unacceptable due in part to its range limitations and marginal accuracy beyond eighty-five meters. Since high-velocity match grade ammunition was a prime factor in the XM21 system, it was thought that the ballistic differences between match and subsonic ammunition would create zeroing problems if used alternately. At that point, further consideration of modified ammunition on an issue basis was dropped.

An explanation of noise suppression and the principal function of the M14SS-1 suppressor was set forth in the Operation and Maintenance Manual for this unit by Sionics, Inc.:

Noise Sources

When the XM21 rifle, or any high muzzle velocity weapon is fired, the resulting noise is produced by two separate sources. Depending on the distance and direction from the weapon, the two noises may appear as one or two closely spaced different sounds. These are the muzzle noise and the ballistic crack, or sonic boom produced by the bullet.

- A. The muzzle noise is generated by the blast wave created by the high velocity gases escaping into



Ninth Infantry Division sniper on patrol in the Mekong Delta region. Photo Credit: U.S. Army.



An Army sniper scanning the area for enemy activity with the ART. Vietnam, February 1970. Photo Credit: U.S. Army.

SNIPER FIRING DATA BOOK

FBI(TUSAMTU) Form 58
13 May 68

METERS FIRING DATA SHEET

ELEV ZERO _____	PLACE _____	DATE _____	NR _____				
WIND ZERO _____	RIFLE NR _____	AMMO _____	TEMP _____				
	SIGHT P LIGHT	WIND WIND	WIND WIND				
	NR	S 1	1	2	3	4	5
	ELEV						
	WINDAGE						
	CALL	⏏	⏏	⏏	⏏	⏏	⏏
	NR	S 2	6	7	8	9	10
	ELEV						
	WINDAGE						
	CALL	⏏	⏏	⏏	⏏	⏏	⏏
	POSITION						

A "Sniper Firing Data Book" employed by Army marksmen in Southeast Asia. The small booklets provided an effective means of analyzing the performance of the sniper and his rifle. Photo Credit: Peter R. Senich.

the atmosphere behind the bullet. This noise is relatively easy to locate as to source, as it emanates from a fixed point.

- B. Ballistic crack results from the supersonic speed of the bullet, which compresses the air ahead of it exactly in the same fashion as a supersonic jet creates a sonic boom. The only difference is that the smaller bullet produces a sharp crack rather than a large overpressure wave with its correspondingly louder shock wave. Unlike the muzzle noise which emanates from a fixed point, the ballistic crack radiates backwards in a conical shape similar to a bow wave from a boat, from a point slightly ahead of the moving bullet. Thus the sonic boom created by the supersonic bullet moves at the velocity of the bullet away from the muzzle noise and in the direction of the target. Location and identification of the initial source of the shock wave is extremely difficult because the moving wave impinges on the ear at nearly ninety degrees to the point of origin. Attention is thus drawn to the direction from which the

wave is coming rather than towards the initial source, i.e., the firing position of the weapon itself.

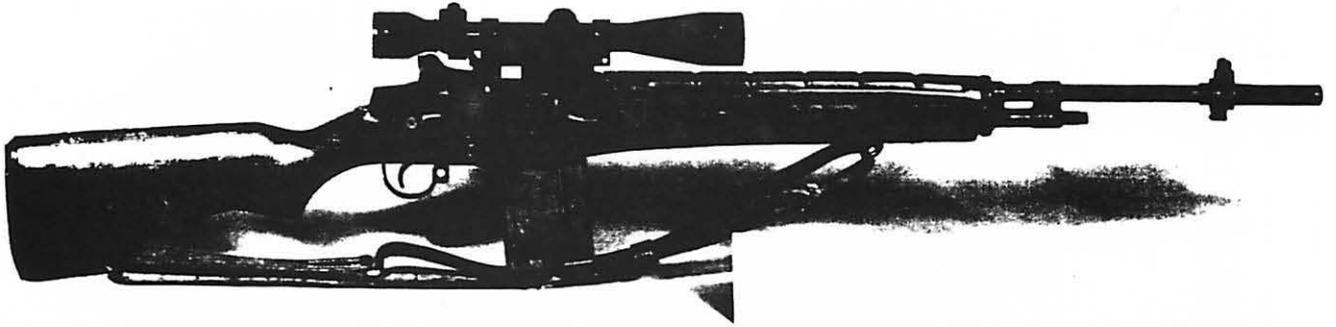
Action of the M14SS-1 Suppressor

- A. The M14SS-1 suppressor is effective in reducing and disguising muzzle noise and has no effect on the muzzle velocity of the bullet. It does not in any way reduce or change the ballistic crack of the bullet.

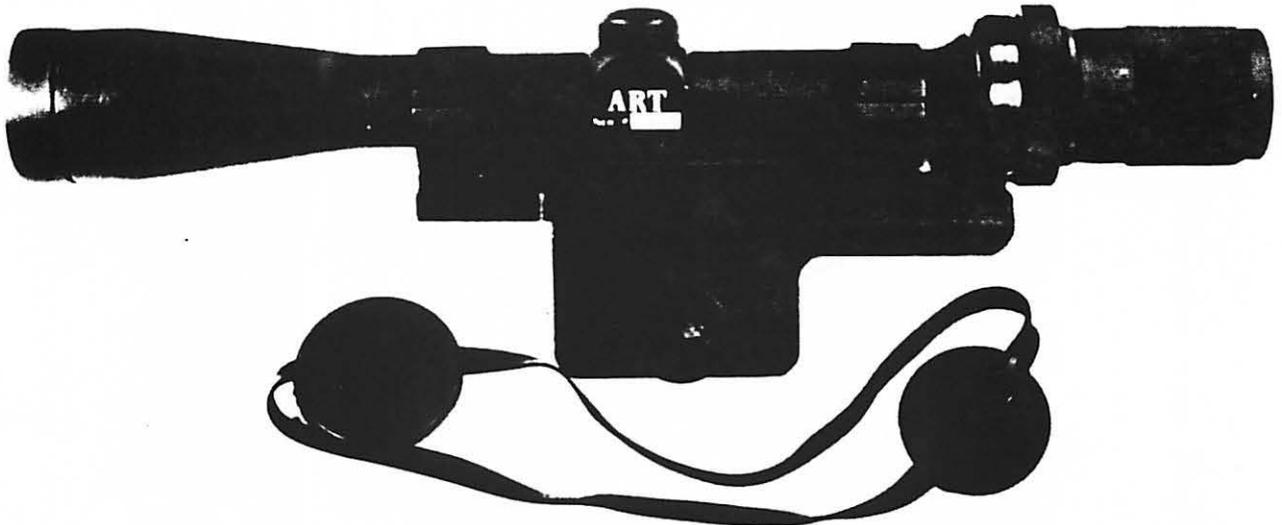
- B. The M14SS-1 suppressor effectively reduces muzzle noise in three ways.

First, the rapidly expanding propellant gases behind the bullet are permitted to flow into the suppressor expansion chambers, which greatly increases the space available in which the gases may expand. As the space into which the gases may flow is enlarged, the gas pressure is reduced.

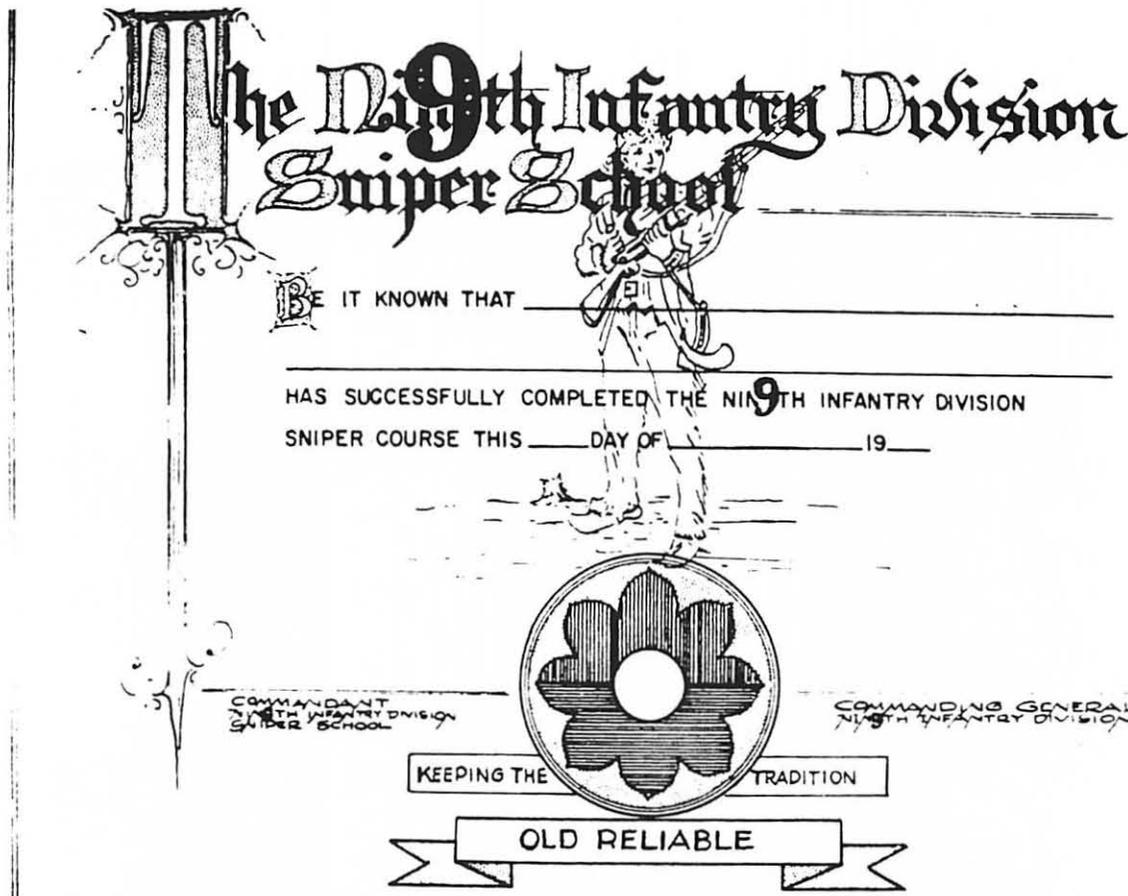
Secondly, the gases entering the suppressor spiral chamber are directed, by the unique design of the suppressor rings, in a spiral path through the chamber before re-entering the bore, and may



In October 1970, the Department of the Army approved the Combat Developments Command "Abbreviated Performance Characteristics for a Sniper Rifle System," based on the XM21's characteristics. The XM21 was eventually adopted by the Army as its sniper standard in 1972, at which time it officially became the "Rifle, 7.62mm Sniper M21." Photo Credit: U.S. Army.



Knowledge gained from seven years of Army testing and combat use brought forth the M21 Leatherwood 3X-9X Adjustable Ranging Telescope following Vietnam. This design withstood 5,000 rounds of continuous fire during tests conducted by the U.S. Navy and erased any doubt of the ART's durability. Photo Credit: Peter R. Senich.



Certificate awarded to 9th Infantry Division marksmen following satisfactory completion of their eighteen-day sniper training. So demanding were the requirements that only 50 percent of the candidates successfully completed the first five classes. Photo Credit: Peter R. Senich.



Snipers reported directly to company commanders, received a briefing on proposed tactics, picked the platoon and area where they thought they could be most effective, and waited for a target. Photo Credit: U.S. Army.



APPENDIX E:

Extract From
"HIGH TREASON"

By:

Robert J. Groden
&
Harrison Edward Livingstone
(Berkeley Books, NY, 1990)

Zapruder Frame 413 (Z413)
&
Blow-up of Z413

by

Robert J. Groden

and

"Partial Portrait of One of the Assassins"
(from the chin down)



Z413

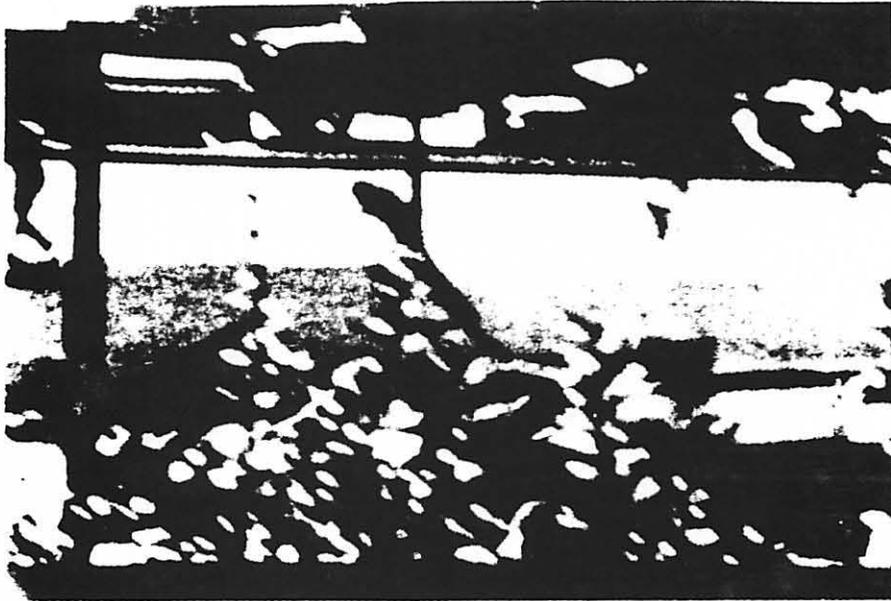
Back of a man's head and possibly a rifle behind the retaining wall on the Knoll.



Z413

Blow-up showing the rear of a man's head.

This is what Mr. Groden sees.



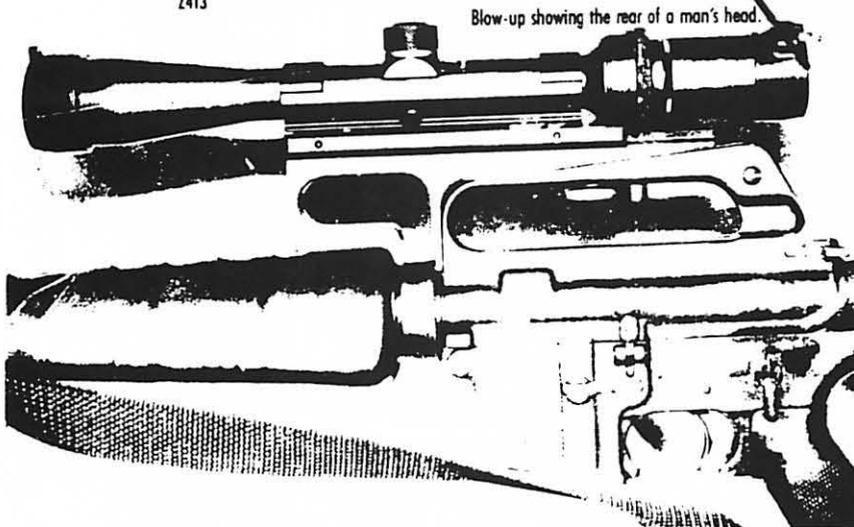
Z413

Back of a man's head and possibly a rifle behind the retaining wall on the Knoll.



Z413

Blow-up showing the rear of a man's head.



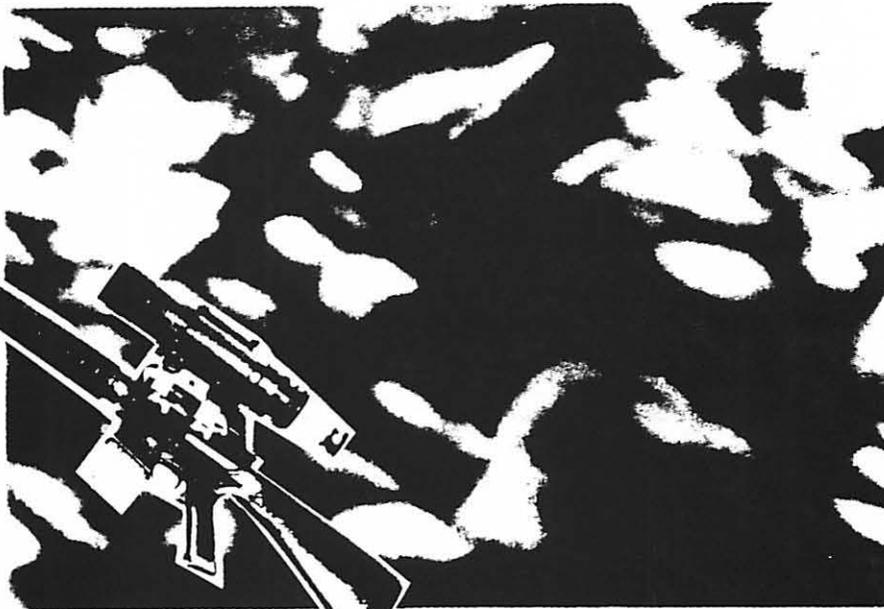
*This is what
Robert Moringstar
sees!*

*RDMA
©, 1992.*



Z413

Back of a man's head and possibly a rifle behind the retaining wall on the Knoll.



Z413

Blow-up showing the rear of a man's head.

*Overlay of M-16 with Telescopic Sight
by Robert D. Morningstar,
©, 1992.*



CE-133-A



CE-133-B



CE-133-C

These pictures were forged in advance of the assassination to make Oswald appear violent, and show him with weapons allegedly used in the murders of President Kennedy and Police Officer J. D. Tippit. When shown the photo on the top left, Oswald stated that it was his head pasted on someone else's body. Note that the shadows on the face come from a noon sun directly overhead, but the body shadows on the ground are from sunlight low on the horizon, at least six o'clock in the evening.



Chin transplant. Oswald's chin was pointed and had a deft. In the picture on the right, the man has a square chin. (CE-133-A)



The crop line in the chin becomes more evident in successive generations of the photos. The crop line is shown (right). (CE-133-A)



CE-133-A

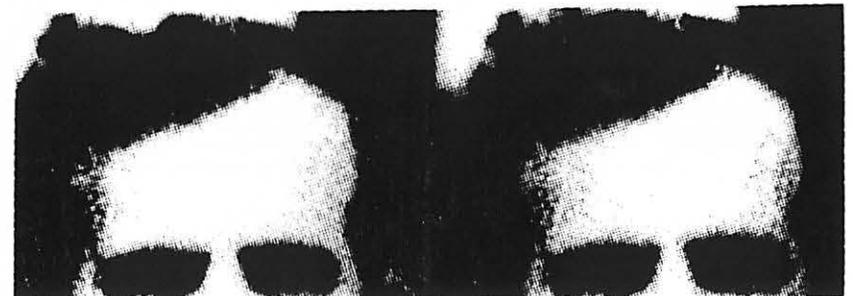


CE-133-B



CE-133-C

These pictures were forged in advance of the assassination to make Oswald appear violent, and show him with weapons allegedly used in the murders of President Kennedy and Police Officer J. D. Tippit. When shown the photo on the top left, Oswald stated that it was his head pasted on someone else's body. Note that the shadows on the face come from a noon sun directly overhead, but the body shadows on the ground are from sunlight low on the horizon, at least six o'clock in the evening.





Partial Portrait of One of the Assassins
(from chin down)

If the photos of Oswald on the previous page were "doctored", has anyone considered that we may be seeing a "partial portrait" of one of the assassins?

Since he had access to Oswald's rifle he may have been a close acquaintance or co-worker and may be the person who really carried the Mannlicher-Carcano into the Texas Schoolbook Depository.

Besides the unique structure of the jaw described on the previous page, his most significant postural characteristic is the severe (50 degree) eversion of his right foot and ankle from a straight "centered" alignment.

The severe "buckling" of the right knee indicates that this person may have suffered some kind of knee injury at one time for the knee joint itself is terribly misaligned in its relationship to the lower leg, right foot and ankle. A knee injury or deformity may indeed be the reason for the 50 degree eversion of the right foot and ankle. The person in the photo may have had some kind of movement problem, perhaps a limp or a unique "hitch" in his gait. He was probably not a good runner or jumper and he probably had one leg longer than the other, the left leg being the longer one.

(Postural analysis by Tai Chi Master Robert Morningstar, Copyright, 1992)

