SADJ

SMALL ARMS DEFENSE JOURNAL

VOLUME 13 NUMBER 3 | MAY/JUNE 2021

SMALL ARMS DEFENSE JOURNAL

VOL 13, NO 3 | MAY/JUNE 2021

SABATTI'S STR OVERWATCH

TACTICAL PERFORMANCE

PROPELLANT SELECTION AND A GENERAL DESCRIPTION OF THE INTERIOR BALLISTIC EVENT

ARGENTINEAN WEAPONS IN CENTRAL AMERICA


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PHOTO: BRUNO CIRCI

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In Memoriam: W. Hays Parks

Sadly, on Tuesday, May 11th, 2021, we lost Colonel W. Hays Parks, USMCR. Col. Parks was born November 8, 1940. Col. Parks has been recognized in many ways. One he was particularly fond of was his selection as the 2016 Hathcock Awardee. As a memoriam to Col. Parks, we print the letter submitted with his nomination.

Hays, you will be dearly missed.

ROBERT BRUCE

Nomination of W. Hays Parks for the Hathcock Award

"The Hathcock Award is presented to recognize an individual who, in the opinion of the Small Arms Committee Executive Board, has made significant contributions in operational employment and tactics of small arms weapons systems which have impacted the readiness and capabilities of the U.S. military or law enforcement."

Hays Parks is the most qualified, deserving and long unrecognized candidate for this prestigious award. To those who know Hays, have worked with him, observed and benefitted from his efforts, nothing more needs to be said. He is the epitome of the Hathcock Awardee.

The warriors Hays represents know him as a "Yes Man." They ask for ammunition to accomplish their mission and he works diligently to be able to answer "Yes." He's been the opposite to those that wish to deprive our warriors of the tools they need.

His support and work behind the scenes has been a part of every major small arms ammunition improvement in recent history. He authored the opinion that the projectile most commonly known as "Boat Tail Hollowpoint, Match" was actually legal for combat operations. His in-depth understanding of ballistics and where to obtain factual data on projectile performance resulted in the reclassification of that type of projectile as "Open Tip Match." Interestingly enough, the first inquiry Hays answered regarding use of this type of projectile was for competition only.

ROBERT BRUCE

Hays' approval included the admonition that it would likely receive a favorable review for combat use, if asked. Once the DOD got around to asking for approval of the OTM projectile for combat use, Hays wrote the legal opinion that approved it. This was initially in 7.62x51 mm but has also spread to other cartridges.

This review set the precedent that the American warfighter is legally entitled to use the most precise ammunition available in the military system, previously prohibited solely because of its … appearance. The projectile has an opening at the tip. This opening is a by product of manufacture. It had never been approved for combat because no one in the JAG system prior to Hays Parks had the combination of current and historical legal knowledge, extensive ballistic experience, bulldog tenacity and articulate grasp of the English language to "fix" a misapplied standard.

His fundamental philosophy: *"To provide maximum support for the first Marine across the beach, the first assaulter through the door, the sniper taking the cold bore shot, and other U.S. military and law enforcement personnel operating in or likely to operate in harm's way."*

He supported each as best as he could—including being given the responsibility on behalf of the U.S. to defeat repeated attempts by the International Committee of the Red Cross and others over more than a quarter of a century to deny our fighters those critical tools—and succeeding in thwarting those attempts.

His mantra is *"If there is a legal issue, fix it. Simply answering 'No.' or 'You can't do it.' does not constitute effective legal advice."*

In writing the first opinion on OTM (Open Tip Match Bullets), Colonel Parks set the groundwork for his later opinions regarding OTM versions MK248 Mod 0 and Mod 1, M118LR, AB39, MK262 Mod 0 and Mod 1, SOST, MK255 Mod 1 and many more, including some that some of you may have used but discussing in this arena is not appropriate.

His work to make these rounds available to our troops has resulted in more effective fire on our enemies and fewer chances for those enemies to fire back or ever again pose a threat to U.S. forces.

These actions saved American (and Allied) lives.

Hays did more than just answer paper requests. He encouraged innovation, provided careful guidance to those responsible for development, and used articulate, masterful analysis to meet our treaty and policy obligations while at the same time giving the most effective, lawful ammunition to our troops.

Hays has provided support since 1979 for Joint Special Operations Command Forces, including Special Mission Units, primarily by providing legal reviews for essential weapons and ammunition for their critical missions. Hays approved every

request for small arms weapons and/or ammunition that was presented to him. He only rescinded one approval, a munition for which the description provided to him was later discovered to be erroneous.

From 1979 until 2006 Hays was the senior U.S. representative at every multinational conference or other meeting in which proponents (governments and non-government organizations) put forward proposed treaty prohibitions or additional restrictions on military small arms ammunition. He not only defended our positions, he led the charge in opposition of proposed restrictions.

Hays provided legal support and training for Army Special Forces snipers, components of the Navy Special Warfare Command, the Marine Corps Scout-Sniper School and for federal, state and local law enforcement through various programs. He continues to participate as a subject-matter expert in an annual Naval Special Warfare Command (NAVSPECWARCOM) sniper conference instituted five years ago, now attended by snipers from U.S. and Allied military forces. Though few are aware, Hays has donated any compensation received for these extracurricular support efforts to Unit and Navy operators support funds.

This written record is simply documentation for the future, when Hays Parks is a historical legend. He is currently a contemporary figure, a warrior still on duty in so many ways. He continual service began in 1960, as a Deputy Sheriff and a Guard for the U.S. Marshal's service transporting felons. It continued with joining the Marines in 1961, volunteering for duty in Vietnam. In 1979 he converted his regular Marine Corps commission to that of a Reserve Officer and accepted the position of Special Assistant to the Judge Advocate General of the Army.

In addition to the "meat and potatoes" of his work with defining OTM and authoring other legal reviews to ensure our warriors got what they needed, Hays Parks did many things he did not have to do.

He always sought personal challenges, such as infantry and recon command, airborne and similar schools. He volunteered for Vietnam and combat assignment when he could have avoided it. He volunteered for every school he could attend, and the tougher the school, the better. This philosophy continued even after his assignment to the Judge advocate General's Office, when rank and position might have made such schools seem superfluous. To Hays, it was important to know the job intimately. To do his job at the level his pride demanded, he needed the perspective of the guy on the ground, pulling the trigger.

PROVIDED BY DAN SHEA

2018 April, AIM X. Dan Shea and Hays Parks.

We had concern that Hays, in his normal humble fashion, would be reluctant to accept this award. Breaking with tradition, we contacted him before proceeding with this nomination. Fortunately, FBI Supervisory Special Agent Scott Patterson summed it up perfectly: "If the most deserving individual refuses to accept an award, its value is diminished." With that understanding, Hays accepted our proposal for his nomination.

In summary, Hays Parks' efforts have had a positive influence on the success of **every** U.S. Military Sniper in recent history. He has likely had similar influence on the success of most of those of our closest Allies. For the above reasons, it is our opinion that Hays Parks is deserving of the Hathcock Award and the eternal gratitude of all of us, especially those whose lives he saved. Yes, he saved lives … there are countless U.S. servicemen alive right now because Hays Parks put more accurate, reliable and effective ammunition into their hands and the hands of their fellow warfighters.

Though he recognizes none of this was done without assistance from others in the community, he was the lynchpin. Without him, it likely would not have been accomplished. SADJ

NEW PRODUCTS

PULSAR

Helion 2 XP50

The **Helion 2 XP50 Thermal Monocular** is a powerful addition to Pulsar's line of products. With an enhanced NETD <40mK thermal sensor, the XP50 can detect an adult-sized object in total darkness or adverse weather conditions up to 2,000 yards away, which is a 900-yard improvement from the Helion 1. With Picture-in-Picture mode on a spotless 640x480 AMOLED display, the Helion 2 XP50 is ideal for law enforcement, hog and varmint hunters, and security professionals.

Features

- Full color 640x480 AMOLED display
- Enhanced thermal sensor up to 2,000 yards
- 8 color palettes
- Built-in video recorder and camera
- Wi-Fi connectivity
- Up to 8 hours operation time on a single charge
- 16 GB memory
- Operates from -25C to 50C
- IPX7 waterproof rating
- Rechargeable IPS7 battery

pulsarnv.com

GALLS®

Field OPS Tactical Pants Available for Men and Women

GALLS, LLC®, the leading distributor of uniforms and equipment to public safety agencies, knows a tactical pant needs more than looks to get the job done. GALLS **Field Operative (OPS) Pants** are designed with fit and function in mind whether sitting behind the desk or running after a suspect. Performance is key and GALLS left no detail out.

Constructed from a lightweight, durable ripstop fabric with mechanical stretch to allow for any active operations, the pant is also treated with DWR (Durable Water Resistant) finish for superior protection against liquid spills. The tunnel-loop waistband expands up to 3" for additional comfort, especially when actively moving. The pant is also bar-tack reinforced throughout and has felled seams for extra durability and confident performance and a full gusset for ease of movement when bending, squatting, or climbing. Smart pockets provide proper storage like the front magazine or cell phone pocket for quick retrieval and zippered, side-entry internal cargo pockets for essential items. Standard side pockets have a mini-gusset designed for easy clipping a small tactical knife and keeping it secure. The zippered fly features a YKK zipper for extra reliability and a G-Shield shank button with an internal melamine button for security.

galls.com

NEW PRODUCTS

PRIMARY ARMS OPTICS

GLx 4-16x50mm FFP Rifle Scope with ACSS® Apollo® 6.5CR/.224V Reticle

Primary Arms Optics has released a brand new long-range precision optic designed for use with 6.5 Creedmoor and .224 Valkyrie cartridges: the **GLx 4-16x50mm FFP Rifle Scope with ACSS Apollo 6.5CR/.224V Reticle [MPN: 610116]**. This scope is part of Primary Arms' GLx line, which brings premium technology and materials into an approachable price range. This is the first GLx rifle scope to feature the proven ACSS Apollo reticle, which provides instantaneous firing solutions for 6.5 Creedmoor, one of the most popular long-range cartridges, as well as .224 Valkyrie.

Available now for $699.99, the GLx 4-16x50mm FFP Rifle Scope has earned a stellar reputation for its performance at long range, and the release of the ACSS Apollo reticle will be a major draw for fans of the 6.5 Creedmoor and .224 Valkyrie cartridges. With build-in target ranging, range-adjusted wind holds from 5mph to 20mph, and a finely tuned first-focal plane BDC, the ACSS Apollo is one of the fastest long-distance reticles on the market, allowing for quick corrections while moving between targets hundreds of yards apart. Even at close range, the Apollo's infinitely precise center chevron allows for unerring precision with a clear point of impact. In addition to the BDC, the ACSS Apollo features an integrated MIL system for MIL/MIL exact firing solutions.

This reticle is backed with a cutting-edge optic that allows for full effectiveness, even in adverse conditions. The GLx 4-16x50mm FFP Rifle Scope is relatively lightweight at 23.5oz, while the 50mm objective lens offers superior clarity with premium low-dispersion glass. GLx scopes are also known for their locking, zero-resettable turrets, which feature steel-on-steel adjustment rings for true lifetime durability. GLx turrets track with exceptional accuracy, and each click is crisp and predictable for making fine adjustments. Combined with the reticle's center chevron and supporting MIL sections, this optic allows for quick holds or precise adjustment as necessary.

"The GLx 4-16x50mm FFP Rifle Scope is one of our best-selling long-range scopes, and the inclusion of ACSS Apollo helps bring it to the next level," says Terry Mears, Primary Arms' Director of Product Marketing. "As 6.5 Creedmoor and .224 Valkyrie continue to grow in popularity, we expect this scope to become a fast favorite for those looking to improve their agility and precision at extended distances."

primaryarms.com

TASMANIAN TIGER

TT Officers Bag

Whether it's a TDY or another day of patrol, grab the TT Officers Bag. Tasmanian Tiger® USA's new travel/duty bag includes an IFAK pouch because you never know what your job or day entails. Be ready with the **TT Officers Bag**.

Tasmanian Tiger®, a tactical nylon line of products distributed exclusively for the US market by Proforce Equipment, Inc., introduces the new TT Officers Bag, a lightweight, super-organizer trip or duty bag complete with an IFAK pouch in case of emergency.

The TT Officers Bag is a versatile grab-and-go bag or light travel bag designed to carry gear, accessories, and clothing to keep in a patrol car or carry on a mission. The bag can be easily configured to carry by hand, over the shoulder, or worn as a backpack for hands-free operation.

The main compartment front has a MOLLE hook-and-loop panel for configuring additional gear or pouches. The pocket on the front, and the two large pockets on each end, are enclosed with durable YKK zippers. The main compartment features a lockable zipper. The interior has multiple compartments for organized packing. Made from rugged 700DCORDURA® fabric and available in black, the TT Officers Bag has an MSRP of $249.00.
tasmaniantigerusa.com

TACMED SOLUTIONS

Tactical Medical Solutions® (TacMed) Introduces the RISE™ (Rigid Immobilization System for Extremities)

Engineered for professional first responders to be the most rugged, low-profile rigid splint for extremity fractures and pelvic binding in the prehospital environment.

Tactical Medical Solutions, LLC (TacMed), in support of trained first responders both on the battlefield and on the streets, will be the global provider of more than 150,000 groundbreaking splints over the next three years. TacMed is excited to introduce the **RISE™ (Rigid Immobilization System for Extremities)**.

The Committee on Tactical Combat Casualty Care (CoTCCC) recognizes splinting and pelvic binding application as a critical step in preventing additional injury during casualty evacuation. But most splinting devices are cumbersome to carry or pack inside a medical kit. Not only does the RISE significantly reduce the weight and size of current market options, but it is also uniquely capable for both limbs and pelvic stabilization.

Originating from lessons learned on the battlefield, the RISE is a durable, rugged, extremely compact splint for point-of-injury care. It can be intuitively applied under stress as a straight splint, 90-degree splint, or pelvic binder by using a windlass or ratcheting tourniquet with the available cutout slots. Preformed folding points allow the RISE to fit into most individual first aid kits, including all standard military-issue IFAKs. The RISE is radiolucent, blood and chemical resistant, and proudly made in the USA.

The RISE was developed in partnership with the U.S. Army and tested by military personnel at Fort Hood, Texas, and Schofield Barracks in Oahu, Hawaii. "The ability to have fracture and pelvic stabilization capabilities from an IFAK is an advantageous addition for our soldiers and trained first responders." – Dennis Lyons, Director of Business Development for Tactical Medical Solutions®.

SIG SAUER CROSS

New Age Bolt-Action Rifle

Story & Photography by Todd Burgreen

SIG took the best of hunting and precision rifles and developed the CROSS, which features the characteristics of a hunting rifle with the accuracy of a precision rifle.

The folding stock found on the SIG CROSS is adjustable comb height, pad height, pad cant (screws on the pad assembly go 7 degrees either way), a reversible comb and length of pull are all easily adjustable and locked in place with the SIG CROSS. This allows a user to "fit" the CROSS like no other production rifle.

EDITOR'S NOTE: SIG SAUER® recently issued a safety recall for some CROSS rifles. See sigsauer.com/crossrecall for more details and to check your serial number.

"Why?" That was the initial thought when reading about SIG SAUER's introduction of the CROSS bolt-action rifle at the 2020 SHOT Show. This was SIG's reentry into the bolt-action market. Significantly, the CROSS is not intended for the tactical/sniper role—hunting is its realm. Tom Taylor, SIG's Chief Marketing Officer & Executive Vice President, Commercial Sales, answers the "why" for the CROSS:

> Hunting rifles are typically focused on less weight, and accuracy is secondary. Precision rifles are designed for extreme accuracy, with no weight limitations. What was missing from the market was a true

The SIG SAUER Taper-Lok is not only an ingenious mounting system for the suppressor body, but also an effective flash hider or muzzle device in its own right.

SIG CROSS bolt removed from the rifle.

crossover. Our product management team and engineers took the best of both worlds and developed the CROSS featuring the characteristics of a hunting rifle, with the accuracy of a precision rifle.

"Stagnant" is not a word that applies to SIG SAUER, with its innovative products in multiple classes of weapons—handgun, submachine gun, assault rifle, precision, belt fed machine gun and now bolt action. SIG SAUER designed the CROSS bolt-action to not only offer performance with current cartridge designs, such as 6.5 Creedmoor and .308 Win, but also with their highly-anticipated high-pressure ammunition starting with the .277 Fury. The CROSS' action is incredibly rigid but also light, thanks to its one-piece receiver eliminating the need for bedding and action screws. The CROSS one-piece receiver interacts directly with trigger, bolt, AICS magazine and barrel mounting—think AR, but without upper and lower distinctions. This is a change from typical bolt-action methods that serves to minimize many of the accuracy-robbing causes associated with bolt actions while also contributing to ruggedness afield. The SIG CROSS in .308 Win with 16-inch barrel weighs a mere 6.5 pounds.

Still hunting is where the CROSS came into its own, as it is so easy to get into field-firing positions with it.

With any precision rifle, the trigger is a crucial part of the equation. SIG created a fully-housed, two-stage match trigger with a range of adjust-

ment between 2.5 and 4.5 pounds with no creep. The urge to change or tinker with your trigger will not be present with the CROSS. The other noteworthy feature of the CROSS, both in terms of aesthetics and performance enhancement is the fully-adjustable folding stock. Comb height, pad height, pad cant (screws on the pad assembly go 7 degrees either way), a reversible comb and length of pull are all easily adjustable and locked in place. This allows a user to "fit" the CROSS like no other production rifle. Its adjustability mimics what is possible only with a custom stock. This should not be discounted in importance.

For the purpose of this evaluation, the author kept it a "SIG SAUER party" in terms of rifle, ammunition, optic and suppressor. A SIG SAUER SIERRA3BDX 4.5-14x44MM riflescope was mounted on the CROSS. Arrangements were made to use a SIG SAUER SRD762-QD suppressor—it was as simple as installing a SIG Taper-Lok muzzle device adapter. The Taper-Lok is not only an ingenious mounting system for the suppressor body, but also an effective flash hider or muzzle device in its own

The SIG CROSS quickly became a favorite for hunting. Its lightweight and compact nature while maintaining ruggedness and potency is all you can ask from a hunting rifle.

right. The ability to wield a suppressed CROSS in a package which is not at all ungainly is a valued option.

SIG SAUER Elite Hunter 165 grain and 150 grain Elite Copper HT ammunition was used with the CROSS. SIG Elite 168 grain Match was also tested to establish a baseline for accuracy. No ammunition tested produced greater than 1.5-inch groups at 100 yards. The CROSS feeds from standard AICS-pattern magazines with a Magpul 5-rounder arriving with the rifle. It has a proprietary sled follower for optimized single-round loading through the ejection port. The single-stack profile of the AICS lends itself to a thinner overall width for the CROSS and stiffer action due to less material needing to be removed from the bottom of the receiver.

The focus of this article is a return to the hunting style symbolized by the bolt-action SIG SAUER CROSS chambered in .308 Win. (The CROSS is also available in 6.5 Creedmoor and SIG's .277 Fury.) Instead of focusing on long-range hunting scenarios, let's operate under the assumption that "closer is better" when taking an animal. This

SIG CROSS, outfitted with SIG SIERRA3BDX 4.5-14x44mm riflescope and ready-to-mount SIG suppressor (via Taper-Lok muzzle device installed on threaded barrel).

puts the onus on scouting and choosing the best ambush position, or stealthily creeping through the woods in search of your desired prey. Of course, if a 300+ yard shot is the only option, having the ability to successfully place the round where needed is an asset.

The CROSS is tailor-made for pursuing game in rugged/steep terrain. Its high degree of accuracy is also conducive to hunting from stands or ground blinds with shots across wide, clear-cut clearings, yet it still provides svelte handling for spot/stalk techniques. Most do not realize that even with the relatively short ranges involved in thick-timber hunting, pinpoint accuracy is crucial to finding the shooting lane. The CROSS is easily carried in the hand, ready to go when quarry is spotted.

Secured in a hunting pack is another option allowing for hands-free movement with the SIG CROSS. The Eberlestock X31 LoDrag II pack serves as an excellent example. Eberlestock strives to design a pack so items are easy to find. They also make it easy to attach things to the outside of the pack. There's no digging and wrestling with your pack to free an item—it's quick at hand. It's a great combination. By having the pack carry the rifle, your hands are free for all of the things you need them for when you are traversing terrain. The X31 incorporates a tactical weapon-sized scabbard. It has a unique contour shape that tapers at both the top and the bottom, giving the pack an excellent close-to-the-body ride. The packs are fully compressible with pairs of side-mounted compression straps that draw the load upward to optimally position the pack's contents over the wearer's center-of-gravity. The X31 LoDrag II has two generously-sized, form-following pockets on the exterior of the upper and lower front flaps. MOLLE-10 lightweight webbing is used, to which you can attach conventional 25mm MOLLE accessories.

Numerous positive qualities of the SIG CROSS quickly became apparent upon use. The author has always been a fan of using detachable magazines for safely/efficiently loading/unloading a rifle. Every time in/out of transportation, in/out of blind, which happens multiple times a day, requires weapon manipulation that the detachable magazine simplifies. The AR-like safety found on the CROSS is natural to manipulate, considering the CROSS's pistol grip profile. Our blinds were situated with expected shots in the 100- to 225-yard range. The CROSS' MOA accuracy instilled confidence it would do its job.

SPECIFICATIONS: SIG SAUER CROSS

CALIBER: .308Win
BARREL: 16in stainless steel, 1:10RH twist
OA LENGTH: 36.5in
WEIGHT: 6.5lbs
ACTION: Bolt
CAPACITY: Detachable AICS, Magpul 5-round magazine with proprietary follower included with rifle
PRICE: MSRP $1,799 USD

The CROSS feeds from standard AICS-pattern magazines with a Magpul 5-rounder arriving with the rifle. The magazine has proprietary sled follower for optimized single-round loading through the ejection port.

The CROSS's pistol grip gives it superior overall carry qualities, with one-handed carry more feasible as well. The natural ergonomic attributes of the CROSS are conducive to quick, well-placed shots when an animal presents itself. This stems from the custom fitting made possible by the SIG stock. Not a lot of time was spent at the bench on Echo Valley Training Center's (EVTC) 100-yard range. There are more indicative evaluations for a hunting rifle than merely firing from a bench at a 100-yard target. The CROSS' adjustable buttstock allows for a good cheek weld that aids in handling recoil by preventing a "slap" of the face that is more typical of the jaw welds found on a lot of rifles when scopes are used. The CROSS proved potent on the "Jungle Walk" range at EVTC with targets placed at 30 yards out to 220 yards. The ability to move through its varied terrain and engage randomly-placed targets hidden within cover suited the CROSS perfectly. Multiple shots fired at most of the targets. The emphasis was on accurate shot placement and how the CROSS's smooth bolt facilitated follow-up shots. The 6.5 pound, 16-inch barreled CROSS is easy to handle with no searching for target required when the rifle is brought up to the shoulder.

The SIG CROSS is well suited for still hunting forays. This translates into fluid off-hand shots at game and not off rests or bipods. If lucky, the hunter will be able to adopt a kneeling or sitting position in lieu of offhand. Range T&E simulated this by setting up clay pigeons at various ranges and then assuming sitting, kneeling or standing shooting positions. Another twist is to have a companion pick the target and shooting position for the shooter to engage as quickly as possible. Follow up shots were encouraged to get a sense of the CROSS' potential. The detachable magazine feature simplifies reloading via a spare magazine. While not empirically quantifiable, the SIG CROSS proved to "hang" well and was very manageable in getting into and out of field shooting positions.

The SIG CROSS is equally at home for long-range engagement. Other range drills consisted of shooting steel targets out to 550 yards on Echo Valley Training Center's Known Distance Range. The key point with the SIG CROSS is it has out-of-the-box performance without the owner having to resort to a trip to an armorer or gunsmith for tuning. The SIG CROSS takes a back seat to no rifle in terms of precision, repeatable accuracy, ergonomics and reliability. A rifle which weighs 6.5 pounds, utilizes a detachable magazine, is chambered in a hard-hitting caliber and is capable of 1.5 MOA or less cannot be ignored. SADJ

WEBSITE OF INTEREST

SIG SAUER
sigsauer.com

Blue Force Gear Micro mounted on belt (*top*), Regular (*bottom*) with Tourniquet NOW! mounted. The small footprint of Micro takes advantage of usually wasted space.

Medical Pouches

A Sea of Options

Story & Photography by Alton P. Chiu

Advances in medical science require more items for effective trauma care than just Motrin and a change of socks. This piece explores the many options to carry them, from Blue Force Gear's Trauma Kit NOW! (in regular and micro size), to ATS Tactical Gear's Low Profile Medical Insert that fits inside a small unity pouch, to a behind body-armor bladder from Phokus Research Group. Tourniquet pouches will also be briefly discussed.

Blue Force Gear: Trauma Kit NOW!

The two blowout-type Trauma Kits have two sizes: Micro and "Regular" (not so termed in marketing literature, but used here to differentiate the two). The content-bearing insert separates from its pouch when needed; this allows mounting whenever space permits while enabling the user to reposition supplies as necessary during care.

The Micro measures 6" x 3.5" x 2.5". Regular measures 7" x 5" x 2.5". Depth varies depending on content, with author's Micro measuring 2" while his Regular stretches to 3.5". The insert and pouch are discussed in separate paragraphs.

Two versions of the Micro mount to either belt or MOLLE. Belt version can be mounted horizontal or vertical. Aside from a contract overrun, the regularly-stocked MOLLE version is mounted horizontal only to take up a 3x3 field. Author mounted his to a Ferro Concepts Bison belt with only a half row of MOLLE top and bottom and experienced no play. When bending over or laying prone, he did not experience discomfort or impediments from the pouch. The Helium Whisper® MOLLE mount is lightweight and each attachment features a Velcro tip that folds back onto the last row to lock in place. The Micro pouch is made of elastic that holds the insert in tension, with a 1" x 2.5" strip of Velcro providing extra security. Author never found his insert coming loose.

The Regular pouch features the same Helium Whisper® MOLLE mount utilizing a 3x3 or 3x5 field. It is an open top Cordura bag with loop Velcro in front to secure the flap of the insert. Elastic bands apply tension across the opening of the bag in order to conform to varying contents. During a multi-day horseback trip, the author carried this trauma kit on his Bison belt at the 3 o'clock position comfortably and securely.

The Micro insert consists of two content-bearing folds with a cover. It comes together like a trifold wallet and is secured by Velcro, so it stays folded when pulled from the pouch. One fold can hold items up to 3" wide and is secured by a single elastic band. The other fold holds 2.5" wide items with two smaller loops for items like ARS needle, EpiPen, Sharpie or small flashlight. It could also fit a HyFin chest seal that was folded in half. There are 3" long pull tabs on both sides so the insert can be withdrawn from either end of the carrier. Pull tabs feature Ball Loaded Index Point (BLIP®) where the material is slightly "tacky" and has a ball sewn inside for tactile identifi-

Blue Force Gear Trauma Kit NOW! inserts unfolded: Micro (*bottom*), Regular (*top*).

cation and positive grip when wet or wearing gloves.

The Regular insert, like the Micro one, is a trifold. However, the flap attaches to the pouch with Velcro. When removed from pouch, it self-opens into a vertical panel from which items can be surveyed and plucked. That said, once the insert is withdrawn, user can re-secure the flap to form a trifold wallet, just like the Micro, so it can be passed around. Flap has laser cut MOLLE slots for adding the Tourniquet NOW! (discussed later) or other pouches. The main fold has two 2.5″ wide slots that can accommodate bandages up to 5″ long that are secured by two elastics placed 2″ apart. Author can easily fit rolled gauze and pressure bandage in those compartments, but the 3″ wide Hem-Con ChitoGauze do not fit. The other section features six elastic bands to hold smaller items like gloves and tape. The middle elastics are divided again to hold pen-sized items. There is a pocket behind that runs the entire length and can hold a HyFin Compact Chest Seal Twin Pack.

In addition to purchasing the pouch and filling it with own supplies, Blue Force Gear offers pre-filled options.

A clearly-visible medical signal indicator rounds off the package. Laser cut cross symbol opens into a small pouch where user-changeable inserts show through. Micro has a choice of three inserts: Blue with Black on the flipside, glow-in-the-dark or reflective-white, and reflective-white with blue-outline. Regular can choose between Red or Black, and glow-in-the-dark or reflective-white. These feature-rich trauma kits come in different sizes and are sure to fit different needs.

ATS Tactical Gear Insert

For those who have a vertical utility pouch measuring at least 3″ x 8″ x 2″, the ATS Low Profile Medical Insert (SKU ATS-0071) presents a good "drop-in" solution. The insert folds together like a bifold wallet with red webbing Velcro-ing it into a brick shape so it will not come apart if tossed. A large red

JTACtical tourniquet pouch neatly tucks behind holster.

BLUE FORCE GEAR KIT PRE-FILLED OPTIONS

MICRO, BASIC

- Hemostatic dressing for wound packing/clotting (1 included)
- 4” Emergency Trauma Dressing (1 included)
- 9” Medical Grade Easy Tape (6 included)
- Tourni-Kwik Compression Tourniquet (1 included)
- Heavy Duty Medical Gloves (1 pair of large sized gloves)

MICRO, ADVANCED

- QuickClot Combat Gauze
- HyFin Vent Chest Seal (2 seals included)
- Cleer Medical Trauma Bandage 4” Flat Pack
- Decompression needle
- Six 2” x 9” Frog Tape
- Size 28 Nasopharyngeal Airway
- Heavy Duty Medical Gloves in tan (1 pair)

REGULAR

- The H-Bandage, NSN 6510-01-598-8418
- H&H Compressed Gauze, NSN 6510-01-503-2117
- TK4 Combat Tourniquet, NSN 6515-01-542-7696
- 3” x 9” Petroleum Gauze Pad
- Nitrile Gloves (Size Large)
- Combat Medic Tape

Phokus Split Kit Bladder.

carry handle, along with stiff backers sewn into each fold to ensure it holds the shape, enables a sure grip and smoother draw from pouch.

Each fold has three elastic bands to hold items but has no subdivision, complicating organization. Item placement should be carefully planned so important items like haemostatic gauze are more accessible than medical tape. This arrangement does mean the entire 3" x 8" area is useable and can easily hold ChitoGauze, compression bandages or other bulky items.

Methods of carry are only limited by one's imagination. While the insert is just a bit too wide for the ubiquitous double M16 magazine pouches, the author found it works well in an ATS Slimline Upright GP Pouch (SKU ATS-0233), which takes up only two columns of MOLLE. There is even enough leftover space to hold trauma shears or other accessories. Backpack side pouches sized for 48oz Nalgene bottles also seem to work, along with abdominal pouches that hang under a plate carrier.

Phokus Research: Under Body Armor Bladder

For those wearing body armor already festooned with pouches and gear, Phokus Research provides a low-profile bladder that sits behind the plate, inside a plate pouch. The Split Kit – Terra measures 9" x 11", with corners cut off mimicking the SAPI shape, fits into even a small SAPI plate pouch or mesh pocket of a backpack. As the name implies, the bladder subdivides down the middle with two YKK zippers for access. A pull tab at the bottom helps retrieve it from the plate pouch. Other offerings from the company include a Nautilus pouch, which adds waterproofing at the expense of cost. Those requiring no subdivision can choose the Zippered Training Bladder which measures 9" x 12" and functions much the same.

Phokus offers two pre-filled SAPI-sized options: Deployment Trauma Kit and the DTK 2 Split Kit. They have

Phokus Bladder partly withdrawn from plate pouch *(left)* and in mesh pocket of HPG Connor pack (*right*).

PHOKUS RESEARCH BLADDER PRE-FILLED CONTENT

- Combat Gauze
- Z-Fold Gauze x2
- Occlusive Dressing x2
- Decompression
- NPA W/550
- 3" Elastic Bandage
- Nitrile Gloves
- Casualty Card
- 2" Safety Pins x2
- Sharpie

the same content, but are packed in different containers— the Deployment Kit comes pre-sealed and is opened by pulling a ripcord while the Split Kit uses the aforementioned zipped bladder.

When product was used with a Crye AVS plate carrier, author experienced no comfort issues. The torso-side of the plate pouches features a backing that prevented bulging when worn in the front plate pouch and the harness was not pressured when worn in the rear plate bag. Indeed, the author did not notice its presence at all.

There are some limitations regarding the amount of content and access speed. Manufacturer quoted thickness as 0.75", and the author found that to be about the maximum and still fit inside the AVS plate pouch with Hesco 4800 plate. Even then, it was a bit of a cram. This excludes thick items like large amount of rolled gauze. If one were using thinner plates, like Hesco 4800LV, it is conceivable to fit more. The combination of plate and plate pouch really drives the amount of content carried.

It was also not the fastest to access due to tight fit. First, undo the Velcro that closes the plate pouch (sped up by pulling a webbing tab made for such an occasion on the AVS and many other plate carriers), one then finds the bladder tab and pulls out the bladder while holding the armor plate in. Manufacturer video recommends adding Velcro to the plate and plate pouch so the plate will not fall out when the bottom flap is undone. In the author's case, the tight fit made for a slower removal than he desired for supplies needed right away. Because it exploits unoccupied space, this bladder is still a very useful piece of kit albeit for support items, such as Mylar blanket and extra dressing, while immediate-need items, such as haemostatic gauze,

ATS Insert inside a vertical utility pouch.

NAR Cummerbund C-A-T Holder tucked under cummerbund (left) and dangling under plate pouch (above), note how the JTACtical pouch is accessible once belt is done.

reside closer to hand.

TQ Pouches

Tourniquets must be easily accessible to timely staunch life-threatening haemorrhage. This section introduces several such products, starting with the JTACtical Multi Mount Tourniquet Pouch. A flap-covered fabric pouch, it protects the tourniquet against UV degradation while keeping the Velcro clean. Its elastic sides can stretch to hold different tourniquets; while designed for C-A-T and SOFT-T, author found it also fits the SAM XT. The original version has a belt loop for horizontal carry and Velcro tabs to mount to many surfaces, such as vehicle roof handles. The 2.0 version has 5x1 field of MOLLE that requires a MALICE clip or WTF strap to weave onto other equipment.

North American Rescue Cummerbund C-A-T Holder works with plate carriers with a field of Velcro in front. Attached there, the tourniquet tucks right next to the front plate pouch, under the cummerbund, for a vertical draw. Unlike other "expansion wings," this product does not have foam padding—along with ends of tourniquet protruding, this carry method may not be the most comfortable when used on "sandwich board" plate carriers. Author did not experience this with the AVS harness, as its thickness provided some stand-off. Nevertheless, he dangled his holder under the plate pouch for a horizontal draw, albeit a non-ambidextrous one because of the windlass wings. Note that some placards (e.g., Shaw Concepts Elastic Placard) and danglers (e.g., Spiritus SACK Pouch) already incorporate such a method of carry in their design.

Blue Force Gear Tourniquet NOW! is as minimalist as it gets. It can be homed on top of the regular Trauma Kit NOW! flap or anywhere with 1x3 column of MOLLE. C-A-T has a more uniform profile that pulls out easily, but the SAM XT has additional bumps that hang up on the elastic bands. The design also leaves the tourniquet more exposed and the author found his caked in dust after wearing it externally on a back-country trip. Author has also found the elastic to wear over time, but that is the nature of consumables. Its minimalism is second only to the rubber band solution.

Conclusion

There are many ways to skin the medical supplies cat, and this piece presented options ranging from micro to well-stocked and from quick-access to ones capitalizing on unused space in a plate pouch. These options should keep life-saving supplies close at hand for the readers. SADJ

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Engineering Testin Treated, Magnesiu

By Paul Evancoe

Rick Uselton, founder and owner of Polar Barrels, LLC, has developed a profoundly new product to reduce barrel weight, extend barrel life and provide exceptional heat transmission for barrel cooling. Uselton has achieved this using cryogenic barrel treatment and magnesium sleeving.

How it Works

Cryogenic treatment (hardening) can be used on almost any metal, ferrous and non-ferrous, as a means to improve the metal's durability, wear resistance and for stress relief. The process, in this case, is used to lighten the weight and improve the "wear life" of gun barrels by factors of two to six.

M4 with MIL-STD barrel (*rear)* and M4 with Polar Barrel cryogenic stainless/ZK magnesium-sleeved barrel (*forward*). Outwardly, both M4s appear identical, but performance of the Polar Barrel gun is far superior.

g of Cryogenically-m-Sleeved Barrels

Cryogenic treatment changes the entire granular structure of a metal, not just its surface characteristics, so its benefits are not lost by processes like finish grinding to fine tolerances.

Cryogenic hardening is a process that involves slowly cooling a metal part using gaseous liquid nitrogen to temperatures below -238 degrees Fahrenheit over a specific time period. The part is very slowly cooled to prevent creating stresses (weak points) in the metal that can later fail. Once the metal has been cooled to the target temperature, it is held at temperatures at, or below, -310 degrees Fahrenheit for up to 24 hours. Once this phase has been achieved, the part is slowly brought back to ambient temperature. Then it undergoes a heat tempering phase at temperatures up to +300 degrees Fahrenheit to eliminate any brittleness that

Cryogenic treatment and ZK magnesium sleeving can be applied to any gun barrel. Shown here: Ultimate Arms Warmonger .50 Cal Sniper Rifle with Polar Barrel.

may have been caused due to the formation of martensite during the cryogenic phase.

Named after the German metallurgist, Adolf Martens (1850–1914), who discovered it, martensite is a very hard metastable structure with a body-centered tetragonal (BCT) crystal metallic structure. The term "metastability" is used in metallurgy when referring to the hardening phases of statistical atomic ensembles of molecules in transition to their most stable state of strongest bond. Martensite is formed in steels when the cooling rate is so high (fast) that carbon atoms do not have time to diffuse out of the metal's crystal structure in large enough quantities to form cementite.

The term "cementite" originated from the research of French metallurgist, Floris Osmond (1849-1912), who described the theoretic structure of solidified steel as a kind of cellular tissue, where the carbide is "cemented" to the iron. Today, cementite is synoptic with the term "iron carbide." It is a compound of iron and carbon, more precisely an intermediate transition metal carbide with the formula Fe_3C. By weight, it is 6.67% carbon and 93.3% iron. It is a hard, brittle material, normally classified as a ceramic in its pure form, and is frequently found in ferrous metallurgy (gun barrels).

Cryogenically-Treated Magnesium-Sleeved Barrels

Polar Barrels is now offering cryogenically-treated barrels that are sleeved with Uselton's proprietary ZK magnesium alloy, which won't burn like other magnesium alloys. This provides a gun barrel that has a life expectancy of 3-6 times longer than untreated standard steel barrels and is capable of sinking heat (dissipating barrel heat from rapid fire) 60% more effectively than a standard steel rifle barrel. Even better, it can be applied to any barrel, but is especially effective on short-lived, high rate-of-fire barrels like the M4, or hot-burning, short-barrel-life calibers like the 6.5 Creedmoor and .50 cal sniper variants that burn out and require replacement every 1,200-1,500 rounds.

Polar Barrels recently conducted quantitative testing of their barrels to substantiate their claim of superior barrel performance. While they are still testing, the following description will provide you with some impressive preliminary performance data.

For the purpose of testing, Uselton built two M4 rifles chambered in 5.56 NATO. One was a complete MIL-STD with an 18" two-stage heavy barrel. The second M4 rifle was identical to the MIL-STD M4, with exception of the barrel. This M4 was equipped with an 18" cryogenic/sleeved application new-production barrel from Polar Barrels LLC. This barrel was a lightweight cryogenic magnesium sleeve design consisting of two types of metal—ferrous and non-ferrous.

Polar Barrels' barrel assembly is unique. The cryogenically-treated barrel itself is constructed from stainless steel and sleeved with Uselton's proprietary ZK magnesium alloy. Using cryogenics on the barrel and high heat on the sleeve, Uselton joins the two dissimilar metals together by cryogenically shrinking the stainless barrel and heating the ZK magnesium alloy sleeve to expand it. Once the two metals are at their extreme tolerances, they are assembled and allowed to slowly return to ambient temperature, which permanently attaches the sleeve to the barrel.

When comparing the MIL-STD M4 barrel to the M4 Polar Barrel, they outwardly appear the same diameter and form, but metallurgically and performance-wise they differ radically. First, the M4 Polar Barrel (without the ZK magnesium sleeve) is 12 ounces lighter than its MIL-STD cousin. Why? Because, while the same length as the MIL-STD barrel (18 inches), the cryogenically-treated barrel can be made smaller in diameter because of its increase in strength from cryogenic treatment, so it is lighter. A second attribute is the cryogenically-treated barrel gains significant durability over its MIL-STD counterpart, which means a significant increase in barrel life expectancy. Additionally, the ZK magnesium alloy sleeve that gives it the outside diameter look of a MIL-STD barrel provides a measure of heat sinking (heat dissipation) far superior to a MIL-STD barrel—and the sleeved barrel still weighs 9 ounces less than MIL-STD. Finally, the sleeved Polar Barrel costs about 18% more than a MIL-STD M4 barrel, but has a 300% longer barrel life expectancy with improved accuracy. What's hard to understand about the economics in this arithmetic?

Engineering Testing of the MIL-SPEC M4 and M4 with a Polar Barrel

The two guns were tested side by side using 5.56 NATO Green Tip 62 grain ammunition. A series of firing rounds were conducted on both guns by firing 21 rounds each at approximately one round per second. Gun temperatures were measured using an infrared thermometer at the chamber-end, gas block, and the muzzle-end of the barrels to establish baseline temperatures before shooting. These same locations were again measured at one-minute intervals during shooting and immediately after shooting every minute for 12 minutes to record barrel cooling data.

As of this writing, testing is still proceeding and data is being analyzed, but preliminary findings reflect the following. The Polar Barrel magnesium sleeve provides significant barrel heat dissipation. The cryogenically-treated, magnesium-sleeved barrel pulls heat away from the bore much more efficiently (quickly) and reaches a higher peak barrel surface temperature than the MIL-STD barrel. Pulling heat away from the chamber and the interior of the barrel more quickly extends barrel life. Test results thus far infer that Polar Barrels provides a barrel with significantly greater cooling ability, increased strength and longer life than standard barrels, along with a sizeable weight reduction without sacrificing any reliability whatsoever.

Future testing will include efforts to monitor the interior temperature of the barrel, particularly around the chamber, and also increase the total rounds fired and rates of fire. Bore tolerance measurements will be taken for the purpose of comparing wear differentials between the standard M4 MIL-STD barrel and the Polar Barrel. This should provide additional data to demonstrate the benefits of the barrel's cryogenic treatment and the magnesium sleeve in conducting heat away from the interior of the barrel and chamber.

It is a material fact that a cryogenically-treated, magnesium-sleeved barrel has a higher overall stiffness to weight ratio than a steel heavy barrel. This translates to having a higher vibrational frequency with lower amplitude. In terms of shooting accuracy, limiting the variation of a barrel's harmonic vibration provides a better foundation for accuracy

M4 cryogenically-treated barrel and ZK magnesium sleeve with gas block, before assembly of sleeve over the barrel.

of the barrel. Future testing will also be done to quantitively demonstrate improved barrel accuracy.

Stay tuned. This exciting technology is in its infancy and will gain traction in the firearms industry as imagination for its applications expands. For additional information, see **polarbarrels.com.** SADJ

Advisory - The Rising Cost of Resin

There are currently unprecedented increases in plastic resin costs, according to a recent newsletter from TriStar Plastics Corp., a producer of quality high-end polymer and composite bearings and components. This is the result of resin shortages in plastic engineering grades like nylon, PPS and ABS. Other mainstream resins are also seeing price increases from 5% to 30%—with no end in sight. One of the key watchdog groups that monitors worldwide price and availability of plastic resin sent out a warning notice on March 2nd, 2021 saying this is a problem that will likely last through 2021, or longer (into 2022). They also stated that it has been almost 5 decades since the industry has experienced anything like this and there is no indication that prices will stabilize anytime soon.

This means everything made with plastic resin will experience a radical price hike. Things like boats, cars, home siding, furniture, kids' toys, clothing, medical articles, computers, smart phones, etc. will become much more expensive and, to some extent, less available. It also means the cost of polymer-framed guns and plastic gun accessories will sharply increase. When will this take place? It is starting now, so buy your polymer-framed firearms and accessories now while you can still afford them.

One might wonder how the plastics industry got into this situation. There is an answer, but it requires connecting some dots. Every polymer out there starts as a refined oil product. Through various refinement processes a variety of different polymers are created for specific uses. Therefore, the most obvious culprit is the dramatic increase cost of oil that began in January 2021 with the Biden Administration's announcement of the President's Executive Order halting further advancement of the Keystone Pipeline. That effectively stifled U.S. petroleum supply independence and, subsequently, low oil prices in the U.S. Thus, the market pressures of supply and demand become a controlling factor. Too much demand, not enough oil supply and the plastics industry, among others, suffers.

Additionally, a winter snow and ice storm that broke all Texas records occurred largely between February 11 and 19, 2021. Modern Texas had never experienced anything like this veracious storm and was caught unprepared. The Texas governor said, "This will likely be the most expensive natural disaster [with the costliest industrial and economic impact] in the history of Texas." The broad area power grid demands from weeks of abnormally cold temperatures, along with the storm damage to the grid itself, simply could not handle the loads and it shut down, leaving millions without power for weeks. The loss of power subsequently resulted in the shutdown of 85% of the plastic resins production facilities. If that effect on the plastic resin availability was not enough, fires at two other production plants overseas around the same timeframe put them out of commission as well. The timing could not have been worse. The combined shutdowns caused a worldwide ripple effect and a long-term problem for resin availability.

What does this mean to the firearms industry? Prices will skyrocket and remain high even when the refineries are up and running, as there are worldwide shortages of many of our standard resins like nylon, acetal, polycarbonate and the olefins. We have become a plastics-dependent world, and petroleum availability is a necessity. Unfortunately, the Biden Administration appears to see U.S. domestic petroleum independence as secondary to its other agendas. SADJ

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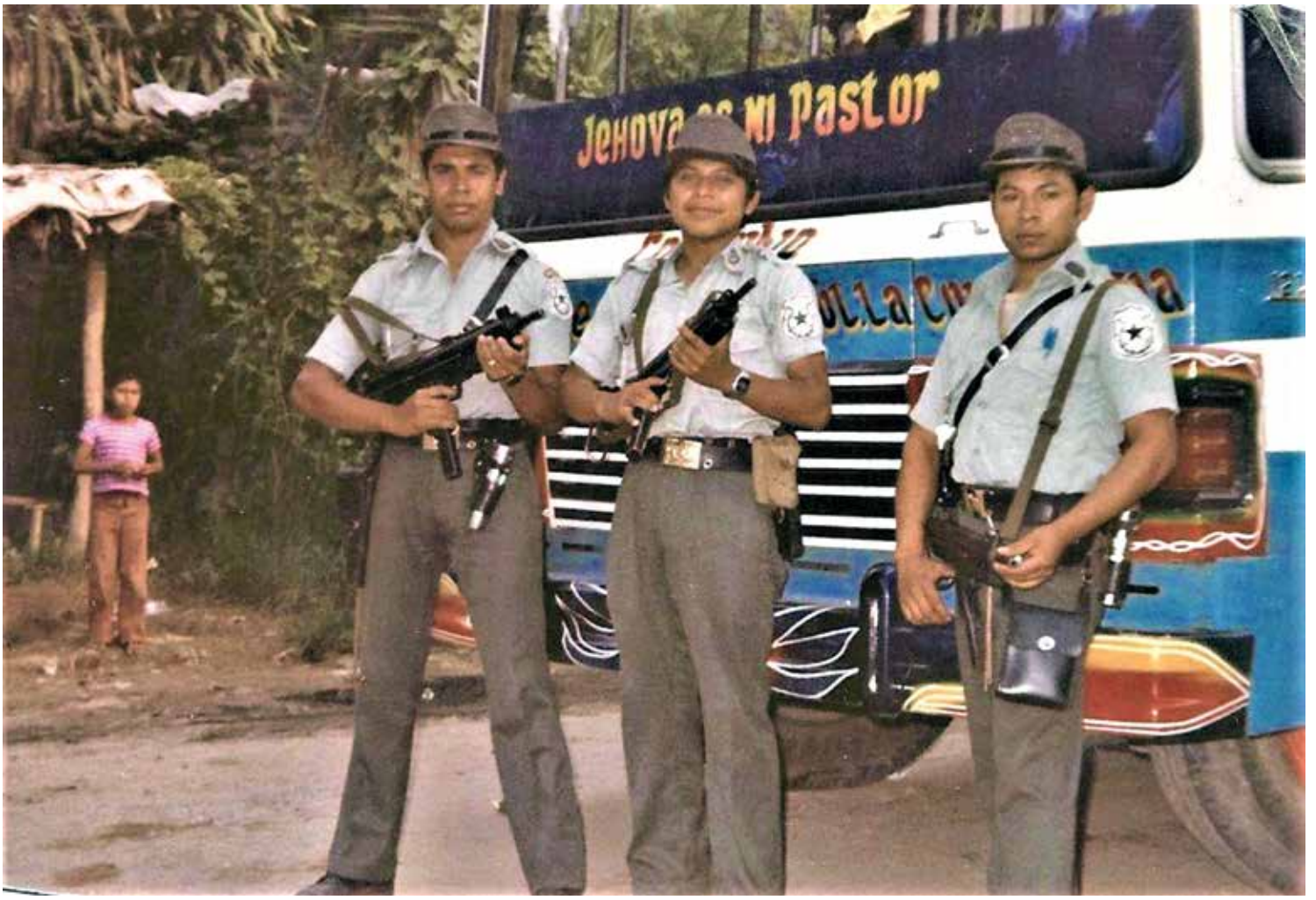


COPREFA

Salvadoran Policemen in El Salvador with FMK-3 SMG.

Argentinean Weapons in Central America[1]

By Julio Montes

By June 15, 1979, the Sandinistas guerrillas (FSLN) had opened a full offensive (called "*Benjamín Zeledón* south-front") in the southern area of Rivas bordering with Costa Rica, moving quickly through Peñas Blancas and dislodging a National Guard relief column at Ostayo River. At Sapoá, the guerrillas clashed with Major Pablo Emilio Salazar ("Bravo" Commander) and his Presidential Patrol, an elite troop of 60 commandos normally in charge of Anastasio Somoza's security detail. The attackers drove Bravo back, down the Pan-American Highway to the former Cibalsa hotel, where the Basic Infantry Training School (EEBI) had established its tactical command post, or Combat Operations Committee (COC). The FSLN guerrillas had maneuvered against the municipalities of Cárdenas and San Juan del Sur, in the Sota Caballo inland sector. They

R. TORRENTO

Honduran FUSEP with a FAL.

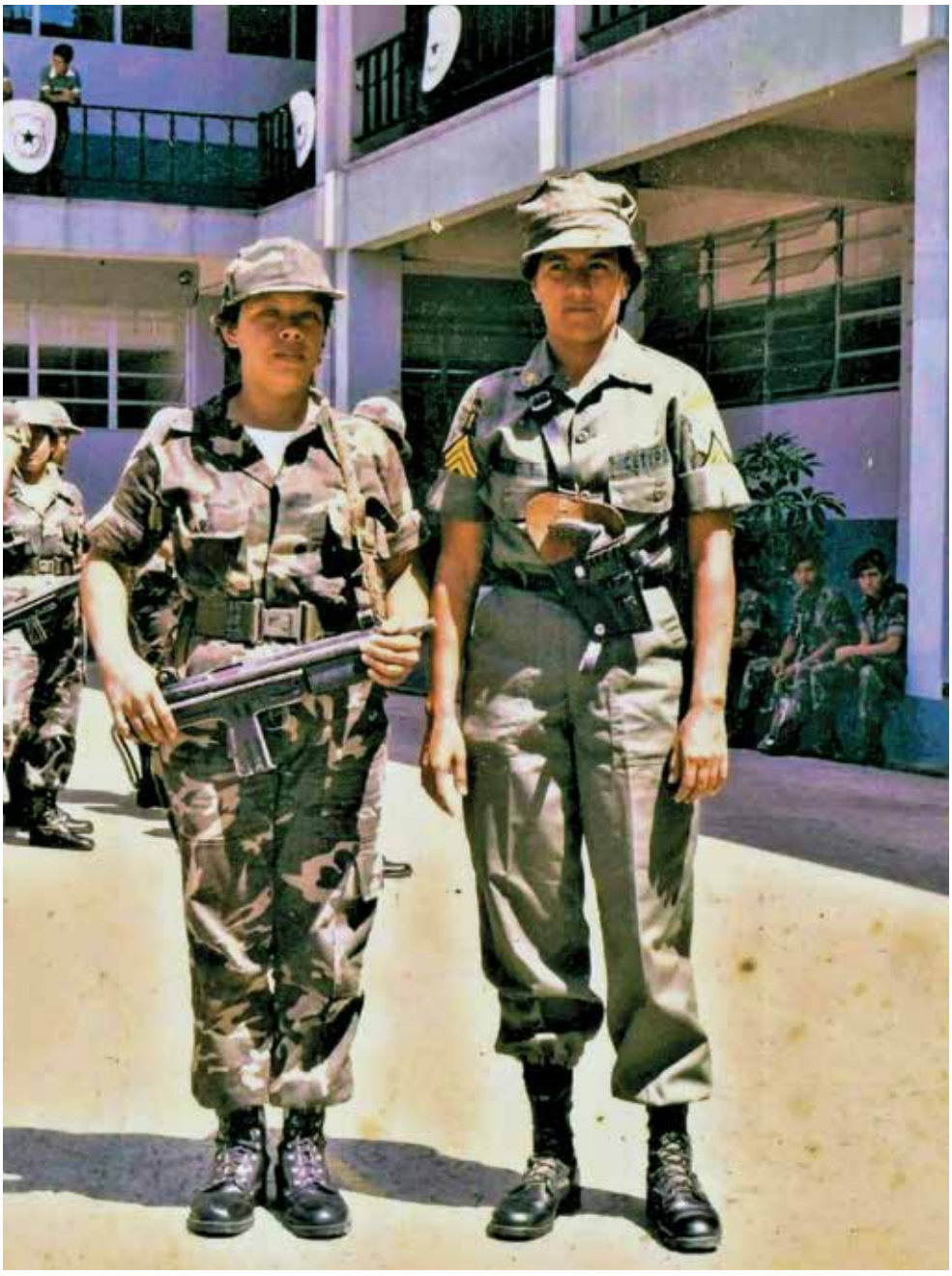
took positions around Hills 106, 109 and La Pita Bridge No.1, and a guerrilla column penetrated El Aceituno sector in Rivas. It was a conventional engagement, with the "Eduardo Contreras" column fighting to control the communication routes between San Juan del Sur and La Virgen, along the coast of the Great Lake of Nicaragua or Cocibolca; the "Francisco Gutiérrez" column was tasked with seizing the communication roads that led to Rivas, from north to south. It operated from Bethlehem to Tola. "Iván Montenegro Báez" column formed the Southern Front's rearguard. By June 17, they were engaged in heavy fighting with the National Guard and the "Ricardo Talavera" column, tasked with the sector along Los Mojones-San Juan del Sur, had been trapped at El Naranjo Ranch, east from the Guard's lines.

The National Guard, under the command of Coronel Enrique Jacoby, pushed back, establishing a defensive line along the river and establishing a command post at El Ostional, in the outskirts of Rivas, stopping the assault and transforming it basically into a trench warfare affair with the guerrillas

J. MONTES

Argentinean Medium Tank Rocket Launch Combat Vehicle (TAM VCLC).

dug in 3kms south from Rivas and 2kms from the border. The Nicaraguan Guard fired against the rebels with a 105mm Howitzer M101 mounted on the Nicarao, a vessel from the Mamenic Line (Marina Mercante de Nicaragua-Nicaraguan Merchant Navy), stationed offshore, and another M101 firing from El



COPREFA

Salvadoran policewomen with FMK-3.

Ostional. There were also a couple of 120mm M65 mortars and a rare saturation rocket system. It was a contraction consisting of a Chevrolet C-10 Cheyenne ¾ ton truck mounting an adaptation of LAU 2/A or LAU32/A helicopter rocket pods [2]. It was actually a first-generation saturation rocket launcher, called Yarará II, developed by Argentina.

Nicaragua and Argentina

Argentina's 1948/1977 Decree-S (Secret), dated 1977, authorized the sale of weapons to Nicaragua[3], stating that Empresa de Desarrollos Especiales S.A. (EDESA), owed by the Argentinean Navy, was allowed to ship 20 LACO launchers for 70mm rockets to equip Cessna O-2, Skymaster aircraft, 8 Albatross launchers for CH 34, 9 MIARVI sights Mod 1, 1,000 Albatross rockets (smoke), and 2,000 rockets with MK 352 Mod AA1 fragmentation heads, and the corresponding technicians to training the Nicaraguan personnel[4]. In 1978, Somoza sent a National Guard mission to Argentina to evaluate the purchase of 10 Pucará ("fortress" in Quechua) COIN aircrafts. The mission included LT. Colonel GN-PA Juan Gómez, Mayor GN-PA Roberto Amador Narváez, Mayor G.N. Julio Chávez and Captain GN-PA Reynaldo Blanco[5]. At the end, Somoza did not purchase the plane, but acquired the rocket launchers for $7,7 million. The weapon sales were brokered by Interpac Enterprises, a U.S. entity, and the Argentinean firm EDESA and the General Directorate of Military Manufacturing (DGFM) "Fray Luis Beltrán." On June 4, 1979, Anastasio Somoza admitted receiving military support from Chile, Argentina and Uruguay[6]. It was reported that the Argentinean Air Force had made 18 flights between June 16 and 30 with weapons deliveries to the National Guard. The shipments included Unimog U-406 trucks and 8 Yarará II launchers with their respective ammunition. The C-10 Cheyenne truck was built by Chevrolet in Argentina starting in 1974, with production passing to Sevel Argentina SA after 1978 as the Chevy-Yarará. It was normally equipped with a Chevy 250 CID engine developing 130hp. The Yarará II saturation rocket system sported a Chevy Yarará truck with a 42-tube launcher on the bed, which fired 70mm Albatross rockets weighing 10.5kg. Its effective range was between 1,000 and 4,000 meters in direct fire mode, and up to 10,000 in indirect fire support. The Albatross could be fitted with different warheads, smoke, HEAT, antitank, fragmentation or incendiary (white phosphorous).

Argentinean weapons sales to Central America did not end with the Nicaraguan National Guard collapse in 1979. In fact, it increased. Operation Charly, was allegedly the code-name given to a program offered by the military establishment in Argentina with the objective of providing military and counterinsurgency assistance, intelligence and logistics support to Central American forces[7]. In the fall of 1981, the (U.S.) Reagan Administration requested an increase of Argentine military assistance to El Salvador. Effectively, on September 2, 1981, Argentina signed agreements to supply weapons with Guatemala and Honduras. Another agreement was signed in March 1982 with El Salvador. In addition to agreeing to coordinate arms interdiction operations, the Argentine General Directorate of Military Industries (DGFM)[8] supplied El Salvador with light and heavy weapons, ammunition and military spare parts worth $20 million in February 1982. In that year, a Salvadoran mission travelled to Argentina looking to purchase a number of Pucara IA-58, but the purchase of the COIN aircraft failed to materialize[9]. Nevertheless, Decree S 721/1982, dated April 8, 1982, under Expedient Nº ÑM2 0012/1, authorized

J. MONTES

Heavy barreled FAL in SINPRODE Buenos Aires.

$17,204,780 in arms to be delivered to El Salvador to include 4.000 Fusiles Automáticos Livianos FALN IV and 6,000 FALN-Para, along with 50,000 magazines and 10,000 bayonets, 2,000 Browning FN 9mm pistols with 2 magazines each, and an additional 2,000 magazines, 20,000,000 rifle rounds, 4,000,000 pistol rounds and 25,000 GME-FMK2 hand grenades, 2,000 rifle AT PAF 62mm grenades, 2,000 PDEF 40mm grenades, 5,000 blank rounds (to propel the grenades), spare parts and even 25,000 pouches for FAL magazines[10].

The greatest Argentine military presence in Central America occurred in Honduras, delivering weapons to the local military, and military officials established training, operations and logistics of the Nicaraguan resistance (Contras). They had a lesser presence in Guatemala, while in El Salvador Argentine's participation was limited to the sale of weapons, the training of Salvadoran officers and the dispatch of specialists. These were intelligence and interrogation experts who trained elements of the Salvadoran Security Corps (CUSEP—the police forces). There were some dozen Argentine operatives in El Salvador up to 1981, but their presence was almost nonexistent after 1982 and the U.S. had taken the lead.

J TURNCIOS

Bateria CSR M1974.

On November 1982, a video tape showing Argentine Captain Héctor Francés García confessing Argentina's intervention in Central America was shown at the Latin American Federation of Journalists (FELAP) in Mexico. Francés García had been seized in Costa Rica by the FSLN, and he claimed to be an element of the Argentinean 601 Battalion. The 601 Intelligence Battalion was a special military intelligence service whose structure was set up in the late 1970s and was disbanded in 2000. The unit was notorious for its operations in Honduras, to include training Contra units in Lepaterique,

J. MONTES

FAL in Honduras.

and training and formation of the 316 Battalion. Francés García's revelations indicated that in Honduras operated an Argentine General Staff, headed by Colonels José Hoya, a.k.a. "Santiago Villegas," and José Osvaldo Ribeiro, alias "Balita," and military advisers, such as Juan Martín Ciga Correa, Carmelo Gigante and Ricardo Correa; they were interrelated with Honduran Army General Gustavo Álvarez Martínez. The 601 Battalion established a presence in Guatemala and then Honduras where they contributed to the establishment of Battalion 3-16.

Hardware

Under Decree S 1116/1982, expedient Nº ÑM2 0025/1, the Argentine government[11] authorized the supply to Honduras of 1,000 Browning HP pistols with 4000 magazines, and 10,000 "EJ" "PAF 62", 1,000 "EJ" "PDEF 40", and 10,000 FMK2 Mod 0 grenades. Heavy equipment included 1000 AP mines, 1,000 AT mines, 100 FM CAL 81mm and 50 FM Cal120mm mortars, along with 20,000 fragmentation grenades for the 81mm mortars, and 2,000 fragmentation grenades for the 120mm. The agreement included production equipment to manufacture 9x19mm, 7.6x51mm and 5.56x45mm ammunition, 1 million 12,7mm and 2 million 9mm rounds. In November 1983, Argentina delivered a shipment of 10 million dollars to Honduras, to include the first 24 FM Cal 120mm models, and those that would become an organic part of the heavy mortar section (platoon) of the Weapons Brigades Company.

Argentina has been producing arms of one sort or another since the late 19th century, and, in the 1930s, established a large and diversified military-industrial complex under the overall supervision of the Dirección General de Fabricaciones Militares (DGFM)[12]. The main small arms production is centered at the state-owned Fábrica Militar de Armas Portátiles "Domingo Matheu" (FMAP) in Rosario, Santa Fe, known as FM Domingo Matheu or simply Rosario. Argentina started production of the FAL in 1960. Argentina also manufactured the FN MAG machine gun, and since 1969 it produces the Browning High-Power pistol (M35 GP). Argentina's Instituto de Investigaciones Cientificos y Tecnicas de las Fuerzas Armadas (CITEFA) in Buenos Aires designed the FM CAL 81mm L mortar. It has a tube length of 1255mm, and it has an approximate rate of fire of 20 shots per minute with a maximum range of 5000m. The FM Cal120mm LR mortar, also produced at the Rio Tercero Military Factory has a tube length of 1663mm, with a rate of fire of 20 rounds per minute, having an approximate range of 8300m.

It is attributed to Argentine's Presidential Decree No.721 the authorization to supply in secret 4000 FAL rifles and 6000 FAL-Para rifles to El Salvador. However, the Salvadoran Army did not adopt the FAL, and continued to receive the M16 from the U.S., and the T65 from Taiwan. It is believed that the rifles were destined instead to arm the Honduran Police (FUSEP), and the Contras. In fact, in 1979 General Gustavo Álvarez Martínez was commander of the Public Security Force (FUSEP), the law enforcement branch of the Honduran Armed Forces, and later commander of Armed Forces. Álvarez Martínez had graduated from the Argentinean Military College (class of 1961), and retained strong ties to the Argentinean military, and sought increased Argentine military influence in Honduras. It is believed that he was responsible for the creation of the 3-16 Battalion, under the "Argentine Method." Battalion 3-16 is said to indicate the unit's service to three military units and the Sixteenth battalion of the Honduran army, and was tasked with the assassination and torture of suspected political opponents of the government. By November 1984, Honduras and El Salvador had begun supplying arms to the contras[13], and the FAL was standard with the Honduras Army and the Contras.

Presidential Decree (Secret) No.721 allowed the sale of 24,000,000 cartridges in 7.62mm and 9mm caliber; 25,000 common grenades; 4,000 antitank grenades and 10,000 cartridges for 105mm guns to El Salvador. The

Salvadoran National Police did receive between 2,000 and 3,000 FMK-3 and FMK-4 submachine guns as well. In 2020 it was disclosed that 2,670 FMK-3 had been exchanged for other weapons[14]. These SMGs were manufactured by Military Factory Domingo Matheu – Rosario. It is made of stamped sheet metal and has a retractable stock. It uses an open-bolt, blow-back mechanism. It is a compact, similar in design to the Uzi. It uses 20- and 40-round magazines. The gun weights (empty) 3.76kg, and 4.260kg with a full magazine. It has a 100m effective range, firing at a rate of fire of 600 rounds per minute. The FMK-3 uses a wire retractable stock. There were no reports on the reliability of the Argentinean SMGs in El Salvador, there were plenty of complaints on the pistols and explosives, with the Brownings experiencing catastrophic failures and the grenades failing to detonate.

Although there is no evidence that the Yarará II was purchased by Guatemala, at least one Armadillo APC was observed mounting two LAU32/A to be used in the surface to surface role, and a contraption probably using Argentine know-how. What is certain is that the military ties between Guatemala and Argentina were renewed between 1979 and 1980. Argentina established the Central America and the Caribbean Department within the Ministry of Foreign Affairs, followed by an agreement on scientific-technical cooperation signed on August 27, 1980, agreeing to a $30 million loan, signed on November 24, 1980 between the Argentine Central Bank and the Bank of Guatemala. The agreement contemplated the sale of arms and ammunition according to the secret act of the Central Bank of Argentina and a commercial one (signed on October 7, 1982), and in April 1981 an Argentine military mission arrived in Guatemala. Argentina delivered 64 Czekalski / M-1974 FMK-1 recoilless rifles.

Czekalski[15]

The FM Czekalski was designed by Alejandro R. Czekalski working at Rio Tercero Military Factory. In 1968, the Argentine Army announced an international tender for the supply of a new recoilless rifle. The contest pitted the Swedish Bofors' Pansarvärnspjäs 1110 (Pvpj 1110), the Spanish CSR-106 (US M40A1) and its own Military Factories' C/SR-105. The demonstrations took place in the town of Magdalena, at the 8th Tank Regiment's firing range. During the trials, the CSR-106 and the Bofors experienced problems, this left the C/SR-105 as the victorious contender, and it was adopted as the M68 Czekalski.

The Argentine C/SR-105 would be a creation of Alejandro R. Czekalski, a military engineer and colonel of the Polish Army during World War II. Czekalski arrived in Argentina in 1948, and his design was developed by CITEFA and built at Rio Tercero Military Factory. The M68 would evolve in the Mod-1974 FMK-1 Mod 1, a heavier, but more compact, weapon than the M40. It weighs 397kg, with a barrel length of 4.20m, having a height of 3m. The gun mount allows an elevation arc between -7° and +40° and has a rate of fire of 3 to 5 shots per minute. It has a telescopic sight and a FAP telemetry rifle that fires a 7.62mm special ammunition. The Model 1968 fires a high-explosive 11kg projectile and a 15kg HEAT projectile. Direct shots are limited to 1,800 meters using the telescopic sight with the staging rangefinder, or 1,200 meters using the telemetry rifle. The M-1974 fires a 16.6kg high explosive projectile, and a 14.7kg HEAT projectile. The HEAT projectile used by the Model 1968 can penetrate 200mm of armor. The HEAT projectile of the M-1974 can penetrate 400mm of steel plates. The Mod-1974 FMK-1 Mod 1 is able to fire the US M-40 ammunition, but better results are obtained by using the four rounds specifically designed for it.

Back to that July 1979 in Nicaragua, the four FSLN guerrilla columns of the Southern Front summed 2,500 combatants, supported by 60 artillery pieces, to include 75mm recoilless rifles, 82mm and three 120mm mortars, and three 14.5mm ZPU-4. The National Guard, on the other hand, had committed all of its armored infantry of the 1st Armored Battalion, using half-tracks and supported by T-17E1 armored vehicles, and the EEBI's four tactical units, some 750 elements in total. The GN lacked additional tactical units, so the departmental commands were left to fend for themselves and fell one by one in the rearguard. In the meantime, the Southern Front remained locked, with the guerrillas pinned down and in strenuous position, and the National Guard pushing from the Ostional-Naranjo axis while another mobile group attacked perpendicularly, and down the elevated terrain. The push broke one of the guerrilla columns, sending the survivors in full retreat.

The Yarará II rocket launchers helped the National Guard to fend off the Sandinistas, but by July 18, 1979 the government troops began retreating after learning that Anastasio Somoza had fled Nicaragua on the 17th. By the 19th, the Guard was in full retreat, with some 150 of them boarding fishing boats at the Nicarao at San Juan del Sur port and sailed, bound for El Salvador. As the NG collapsed, the Sandinistas moved in. It was the end. SADJ

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Propellant Selection and a General Description of the *Interior Ballistic Event*

By Jeff Siewert

Selecting an appropriate propellant for a particular application depends on the following factors:

- Peak Operating Chamber Pressure
- Expansion Ratio of the Firearm
- Propellant Charge Mass / Projectile Mass Ratio

The **peak operating chamber pressure** is determined by the gun mechanism (geometry and materials) and the case structure (also geometry and materials, but including case material hardness). The peak operating chamber pressure influences the propellant selection because the rate of propellant consumption is limited by peak pressure. The burn rate of the propellant is given by Vieille's burn rate equation:

$$r_i = b(\overline{P})^{\alpha}$$

Equation 1: **Burn Rate Equation**

Where:

r_i = burn rate in in/sec or mm/sec

b = burn rate coefficient

P = instantaneous space mean pressure

α= burn rate exponent

If a system is designed to operate at low peak pressures, like a shotgun or a handgun, a propellant grain with a small "web" dimension (e.g., high surface area to grain volume ratio) must be chosen if propellant needs to be completely consumed while the projectile is in the tube. The "web" of a propellant grain is the smallest dimension required to be burned to completely consume the propellant grain.

If the burn rate coefficient and burn rate exponent are held constant in *Equation 1* (e.g., a given propellant has been selected), the only way to make the propellant burn faster (e.g., more inches/sec) is to increase the pressure, and if the weapon has a low peak pressure limit, the powder web must be selected accordingly. Complete combustion of the propellant while the projectile is in-bore aids velocity consistency, reduces flash at shot exit and aids in gun reliability because there are no unburned powder remnants around to impede the function of the gun mechanism. For guns operating at low pressures, a flake geometry provides small web with a large surface area, helping to ensure the grain is completely consumed while the shot is still in the barrel. *Figure 1* shows a comparison of surface area to volume ratio for various propellant geometries.

Figure 1 is a plot of the surface area-to-volume ratio of common small caliber propellants as a function of web size in their "as-made" condition. Flake powders, ball powders and single perf (tubular) powders are shown, along with a C4 offering. Interestingly, the various geometry categories can be "grouped" fairly easily—each geometry has a fairly specific initial surface area / volume ratio according to their web.

Figure 1 only indicates the geometric properties of the propellant grains, it doesn't indicate anything about the level of deterrents that might be applied to the propellant grains. Deterrents delay the combustion of the underlying propellant layers, which would seem to be counter-productive if the goal is to maximize muzzle velocity at a given peak pressure. However, to maximize muzzle velocity, the bullet travel at peak pressure must be pushed down-bore as far as possible, while simultaneously pulling in the bullet travel at propellant "all burnt." Adding deterrent to the propellant surface does the following to help maximize muzzle velocity:

- Pushing the travel at peak pressure down-bore creates the largest possible reservoir of gas at the designed maximum pressure. This maximizes the area under the base pressure vs. travel curve, pushing the muzzle velocity as high as possible.
- Smaller web powders burn out earlier in the projectile in-bore travel. For a given peak pressure, deterred propellants can be made to have a smaller web dimension. By delaying maximum burn rate until achieving peak pressure, the travel at propellant "all-burnt" is reduced, and the generated gases have as much time/travel to operate on the projectile. The system is not expending energy accelerating unburned propellant grains down-bore. This improves resulting combustion efficiency, maximizing muzzle velocity.

Figure 2 shows a cross section schematic and photograph of a "Ball" propellant grain showing the deterrent coating applied to the exterior of the grain.

The next factor in determining muzzle velocity, the **expansion ratio of a gun**, is analogous to the compression ratio of a car engine. The expansion ratio of a gun is the ratio of the volume of the barrel plus the chamber, divided by the chamber volume. For small caliber applications, depending on the length of the bullet, the depth the bullet extends into the case past the case mouth, and of course the internal geometry of the cartridge case, the reloader has the capability to modify the chamber volume a bit. Of course, as the bullet is seated more deeply into the case, the chamber volume is reduced, and as a result, the in-bore travel distance is increased when firing in a given barrel. Pistols usually have fairly high expansion ratios, not because the barrels are so long, but because the chamber volume is typically quite small. *Table 1* lists the interior ballistic characteristics of

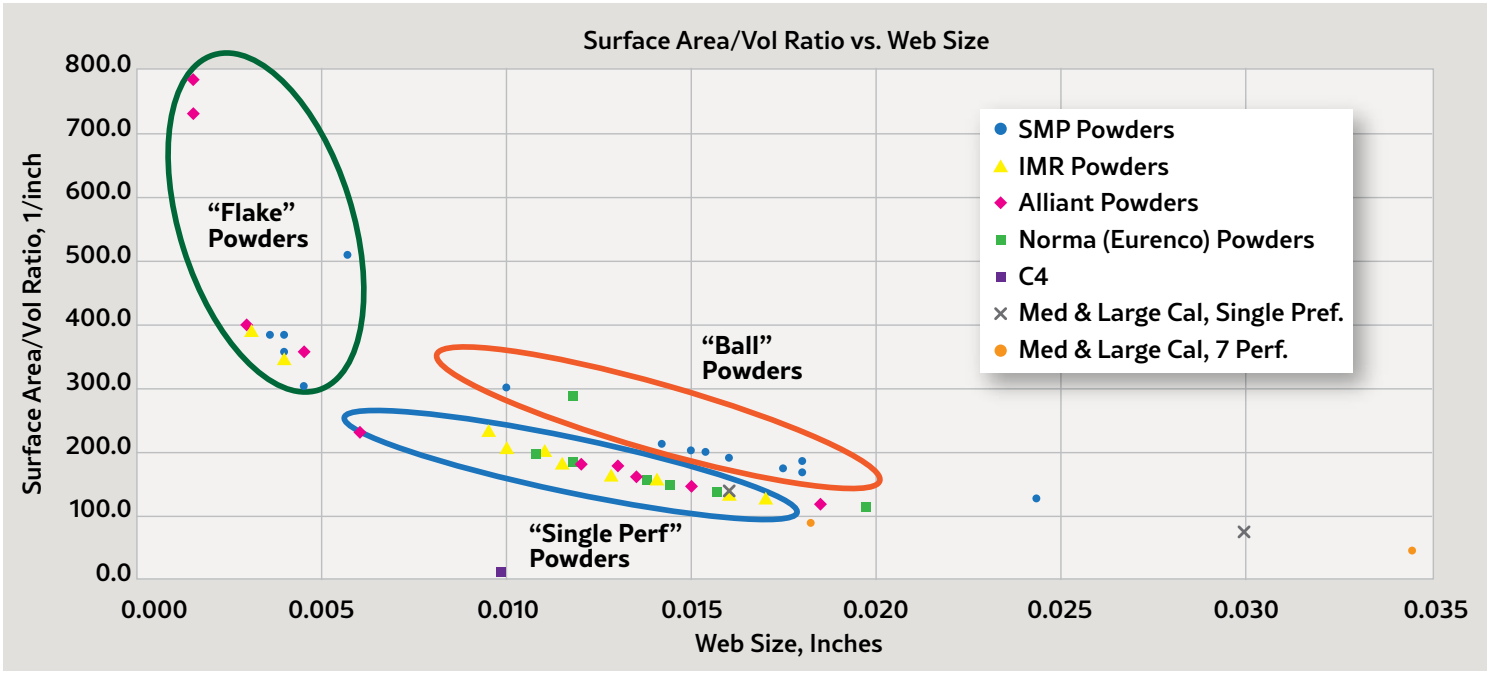

Figure 1: Propellant Grain Surface Area/Volume Ratio vs. Web Size

common small caliber systems.

The **charge-to-mass ratio** of the system is important to selection of an appropriate propellant because the energy of the system (determined by the amount of powder) limits the attainable muzzle velocity. Since the gun mechanism and cartridge case structure determine the peak pressure limits, the acceleration of the bullet is limited by the peak pressure. To increase the muzzle velocity, an increased case volume is required, providing a higher *average* base pressure to the projectile with the selection of an appropriate propellant. By increasing the case volume, as the bullet moves incrementally down barrel, a smaller pressure decrease results for a given amount of travel. Thus, an increased case volume typically increases the velocity that can be obtained at a fixed peak pressure because of increased energy capacity, provided the propellant can be completely consumed while the projectile is still in-bore.

General Description of the Firing Event

The firing event starts when the shooter pulls the trigger on the firearm. By pressing the trigger, the sear is moved, which holds the spring-loaded hammer in the cocked position, out of the way. The movement of the sear frees the hammer, which swings or slides until it makes contact with the firing pin. The firing pin is rapidly accelerated, moving forward until it contacts the surface of the primer cup (for center fire ammunition). This is when the actual interior ballistic event starts. Depending on the relative mass/energy of the firing pin and the clearances between the cartridge case and the chamber, and whether the bolt face contains a spring-loaded eject pin, the

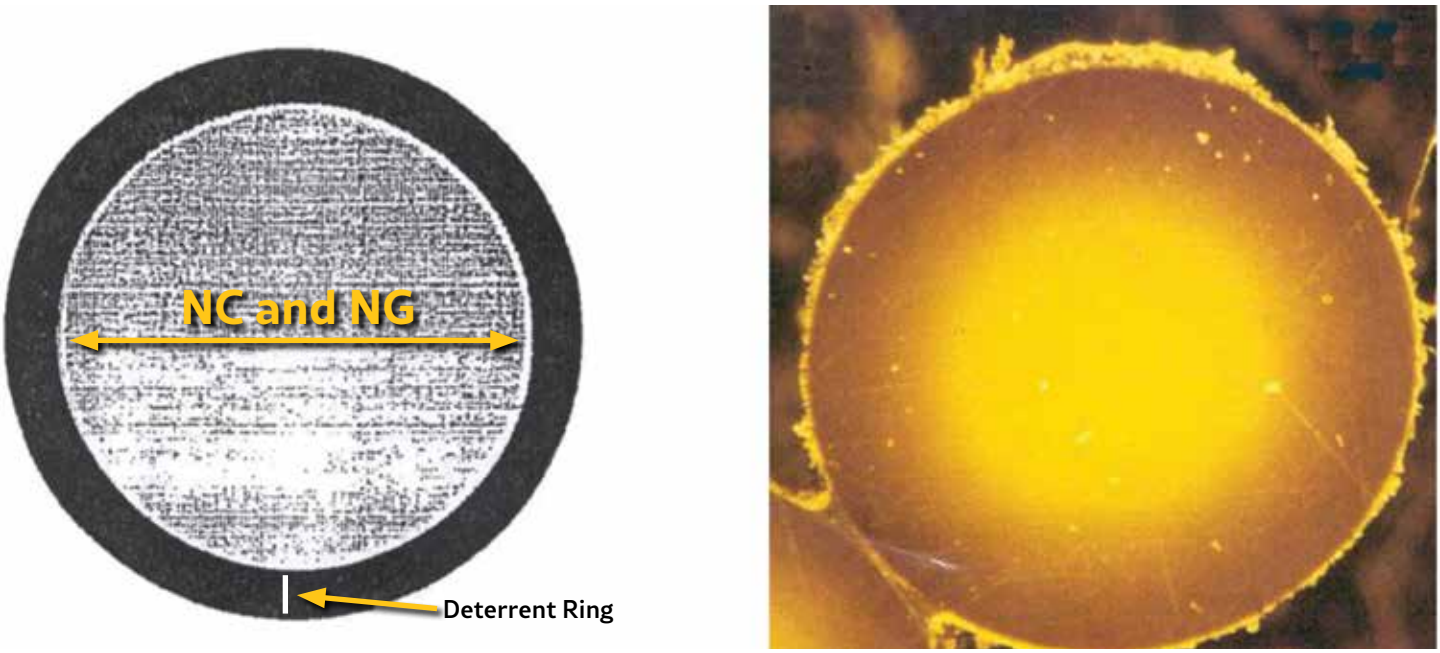

Figure 2: Cross Section of "Ball" Propellant Grain Showing Deterrent Layer

	9x19mm	.45 ACP	5.56x45mm	7.62x51mm	.338 Lapua	12 Ga
Avg. Pmax, PSI	35000	18000	58000	53000	68000	11500
In-Bore Travel, in.	3.65	4.30	13.20	20.20	26.00	22.00
Bullet Wt., Grain	124	230	62.6	148	300	335
PowderChg., Grain	7.0	8.5	25.8	42.0	101.2	45.0
Expansion Ratio	12.8	12.8	5.9	8.4	6.7	44.5
Charge/Mass Ratio	0.06	0.04	0.41	0.28	0.34	0.13

Table 1: **Interior Ballistic Characteristics of Various Small Caliber Systems**

firing pin may move the case forward in the chamber until the shoulder of the case contacts the shoulder of the chamber. If the cartridge mass is sufficiently low and the case is free to move, the firing pin strike can translate the case forward in the chamber until it meets the headspace stop previously described. This forward movement of the case, or the spring loaded eject plunger, causes a gap between the case base and bolt face. For tapered cartridge cases, this forward movement provides minimum radial gap between the case and the chamber. At some point, the case meets resistance with the chamber and the firing pin energy is dumped into deforming the primer cup. The primer mix is pinched between the interior surface of the primer cup (deformed by the impact of the firing pin) and the anvil, and the compression of the primer mix causes it to detonate. The primer mix is converted to hot particles and gas almost instantaneously, and the pressure starts to rise in the primer pocket. If the primer cup is rigidly attached to the case primer pocket via lacquer and crimp, the primer cup cannot move aft relative to the cartridge case as the pressure starts to increase in the primer pocket. If the cup isn't held in place by the belt and suspenders of lacquer and primer pocket crimp, the primer cup moves aft relative to the case as the pressure rises in the primer pocket until the cup hits the bolt face.

As the ignition process proceeds, hot particle-filled gas passes through the flash hole(s) in the case base, transferring the flame front to the propellant bed. At this point the propellant starts to burn due to the contact of the hot particles from the primer gasses coalescing on the exterior surface of the propellant. Primer gases and gases from the burning of the propellant near the primer cause the remainder of the powder to translate in the case, forcing it against the base of the projectile. As the propellant burns, it changes from a solid directly into a gas, causing the pressure to rise in the case. As the pressure in the case increases, the case starts to swell in both length and diameter. Ultimately, the combination of translation of the propellant bed and powder combustion pressure increases to the point where the force on the base of the bullet overcomes the crimp and/or friction of the case mouth restraining the bullet motion, and the bullet is dislodged from the case. Once the projectile overcomes the case retention force and starts to move, the case moves aft axially in response to the unbalanced pressure load acting on the case.

Initially, the pressure in the case continues to rise as the projectile proceeds down the barrel from the gases evolved from propellant burning. Upon attaining a sufficiently high pressure in the case, the case wall deflects outward enough to contact the chamber and case base contacts the bolt face. Once the case wall contacts the chamber and bolt face, the case walls are supported by the strong (typically) steel structure of the firearm, and the case starts transferring thrust aft to the firearm through the chamber walls via contact force and friction between the case body and the chamber.

The case wall is thinnest near the case mouth, and gets progressively thicker near the base of the case. This thickness gradient, combined with a strength (hardness) gradient puts the material with the lowest strength at the case mouth and makes the case contact the chamber near the case mouth first, causing the case to seal there early in the combustion process. As the case contacts the chamber wall, the chamber supports the case due to the mechanical stiffness of the barrel or cylinder. At the same time, if the friction between the case wall and the chamber interior is sufficiently low, the case moves aft in the chamber relative to its initial position due to the unbalanced load generated by the release of the bullet from the case mouth, causing the case base to contact the bolt face not long after the bullet leaves the case.

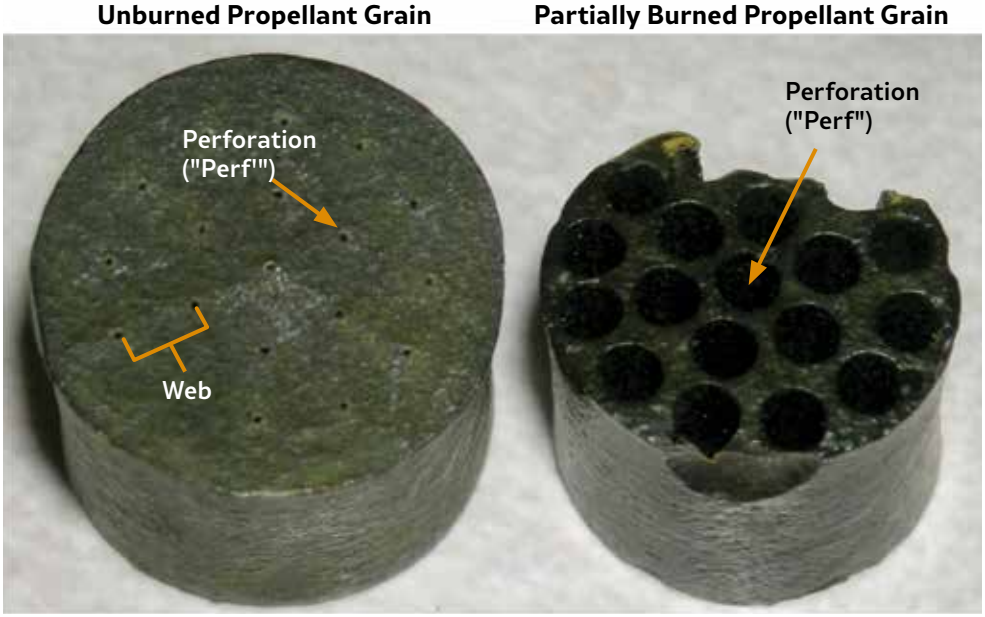

Figure 3: **Photo of Unburned and Partially Burned Artillery Propellant Grain**

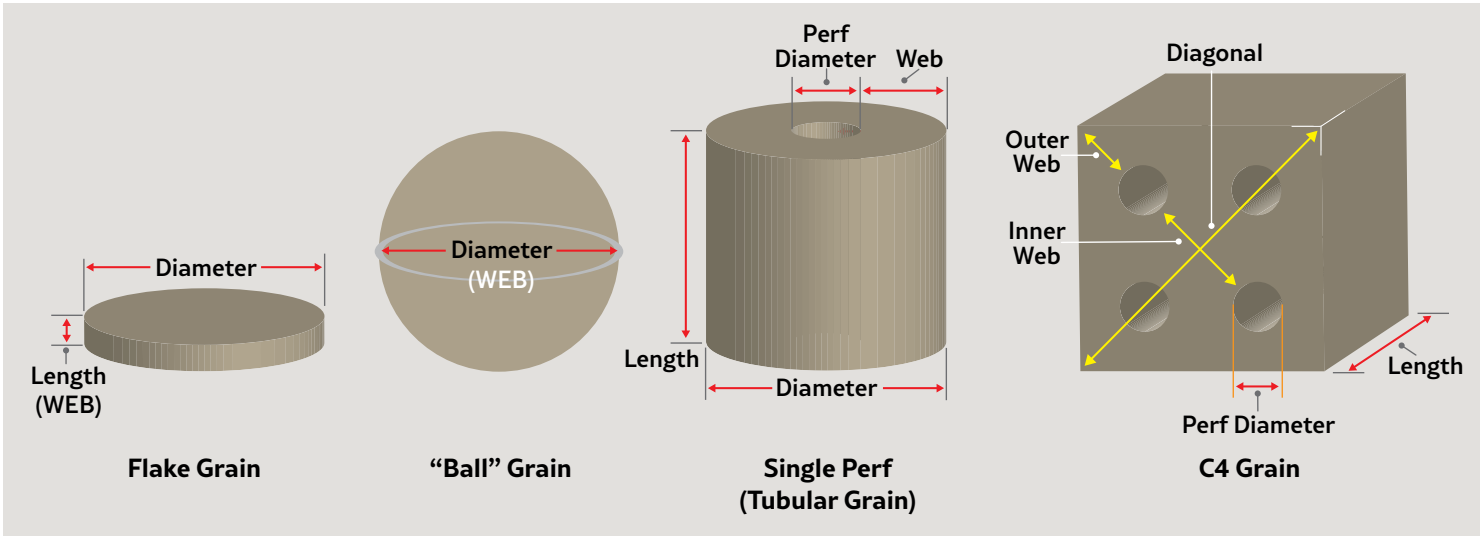

Figure 4: Common Small Caliber Propellant Grain Geometries

The pressure in the case continues to rise and the contact between the case wall exterior and the chamber moves from the case mouth aft toward the case base, helping to prevent gas leakage past the case. The case stretches in the radial and hoop direction until it hits the chamber, and along the axis of the case. The stretch along the axis of the case is limited by the coefficient of friction between the case and the chamber forward of the last contact point and the internal case pressure. As the contact point between the case and the chamber moves aft with increasing pressure, progressively more contact area is engaged and more load can be reacted to the chamber in shear through the area of case-chamber contact. The increasing internal pressure and case-chamber contact area increases the axial load carried by the case wall, with maximum axial stretch (and hoop stretch) occurring just aft of where the case wall last touches the chamber. The large combined stretching just aft of the point of last case contact with the chamber wall causes the case wall thinning frequently seen in the aft portion of cases fired multiple times.

The increasing pressure behind the bullet causes the bullet to accelerate down the barrel despite being resisted by the engraving friction forces, increasing the volume of gas behind the bullet. Eventually, the bullet starts moving so fast that the rate of volume change behind the projectile reaches a point where the gas evolved by the burning propellant can't keep up with the volume increase, causing the chamber pressure to reach a maximum.

From the bullet's perspective, as the projectile starts moving from its initial position in the cartridge, it moves a short distance and encounters the forcing cone of the firearm, provided we're not firing in a revolver. Upon encountering the rifling, the exterior of the bullet is plastically deformed, impressing the rifling form on the projectile's exterior. This engagement causes the projectile to ride the spiral land profile in the bore, making the bullet rotate as it travels down bore. The projectile continues to accelerate as it travels down the barrel, picking up velocity as the propellant gas expands. Velocity continues to increase until the bullet exits the barrel.

Propellant burn continues until the

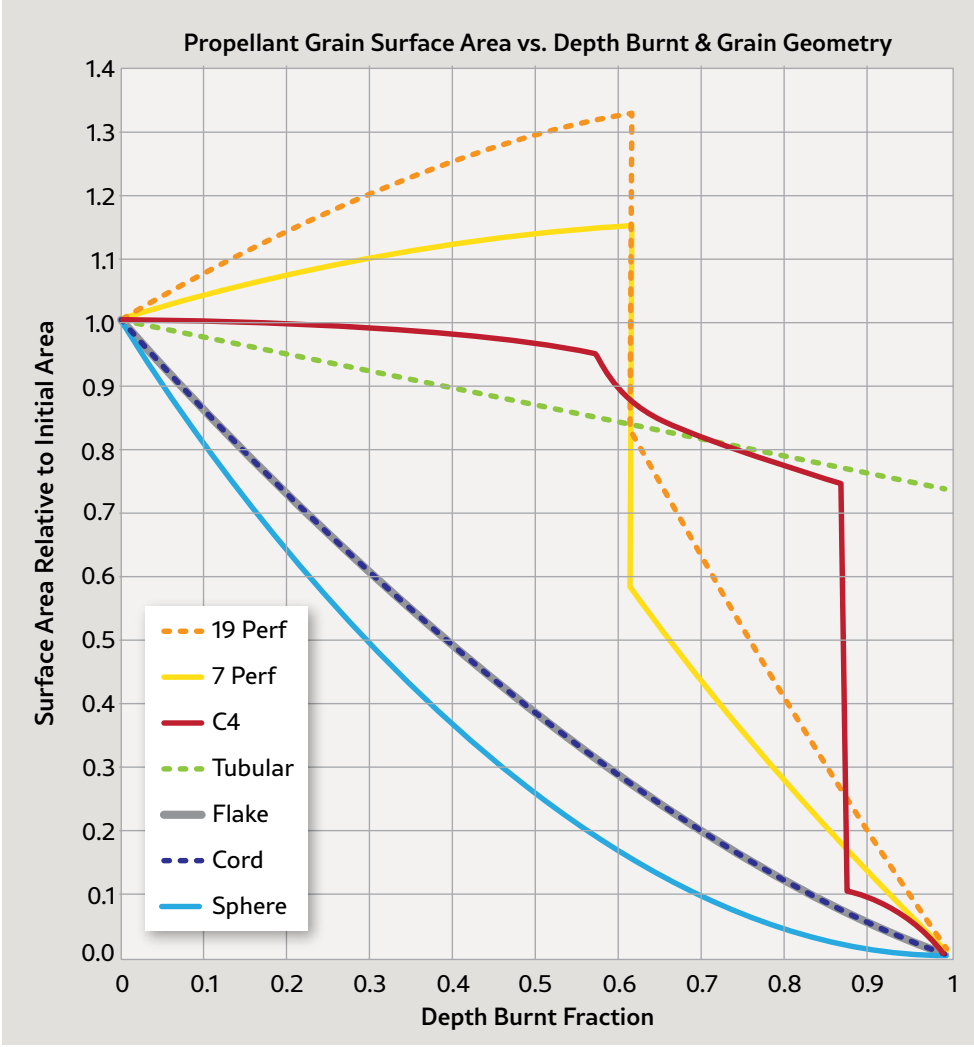

Figure 5: Propellant Grain Surface Area vs. Depth Burnt

Propellant	Pmax, PSI	MV, FPS
4.2g 700-X	31901	1095
5.1g W231	28096	1159
5.6g AutoComp	32491	1164

Table 2: 9x19mm Interior Ballistics Summary

propellant either burns out or the projectile exits the barrel. If there is unburned propellant in the barrel when the bullet exits, a rapid pressure drop occurs in the barrel and extinguishes propellant burn nearly instantly. *Figure 3* shows the "before and after" of an artillery propellant grain whose burning was extinguished by the dramatic pressure drop after exiting the barrel.

In *Figure 3*, a critical dimension called "web" is shown on the unburned propellant grain. The web is the smallest grain dimension which must be burned for the propellant to be completely consumed. *Figure 4* shows propellant grain geometries commonly used for small caliber applications, along with the web for each grain and other important dimensional parameters.

Propellant "progressivity" is an important interior ballistics concept—it can be defined as the ability of a propellant to increase its burn rate after the travel at peak pressure has been attained. *Figure 5* shows the relative surface area of a propellant grain as a function of depth burnt and propellant grain geometry. On the left-hand side is the initial burning surface, and the far right represents all the propellant is consumed.

Use of progressive propellants increases muzzle velocity because they increase the average base pressure acting on the bullet after peak pressure (e.g., there is more area under the pressure-travel curve). Propellant with geometry with more perforations than the C4 grain are generally unsuitable for use in small caliber grains due to the rheology of the energetic compounds and physical dimensions required to form the propellant grains.

Selecting a propellant for a given application might involve more than just a financial decision, depending on the particular needs of the customer. *Table 2* lists a summary of simulated interior ballistics performance for a 9x19mm cartridge using 3 different

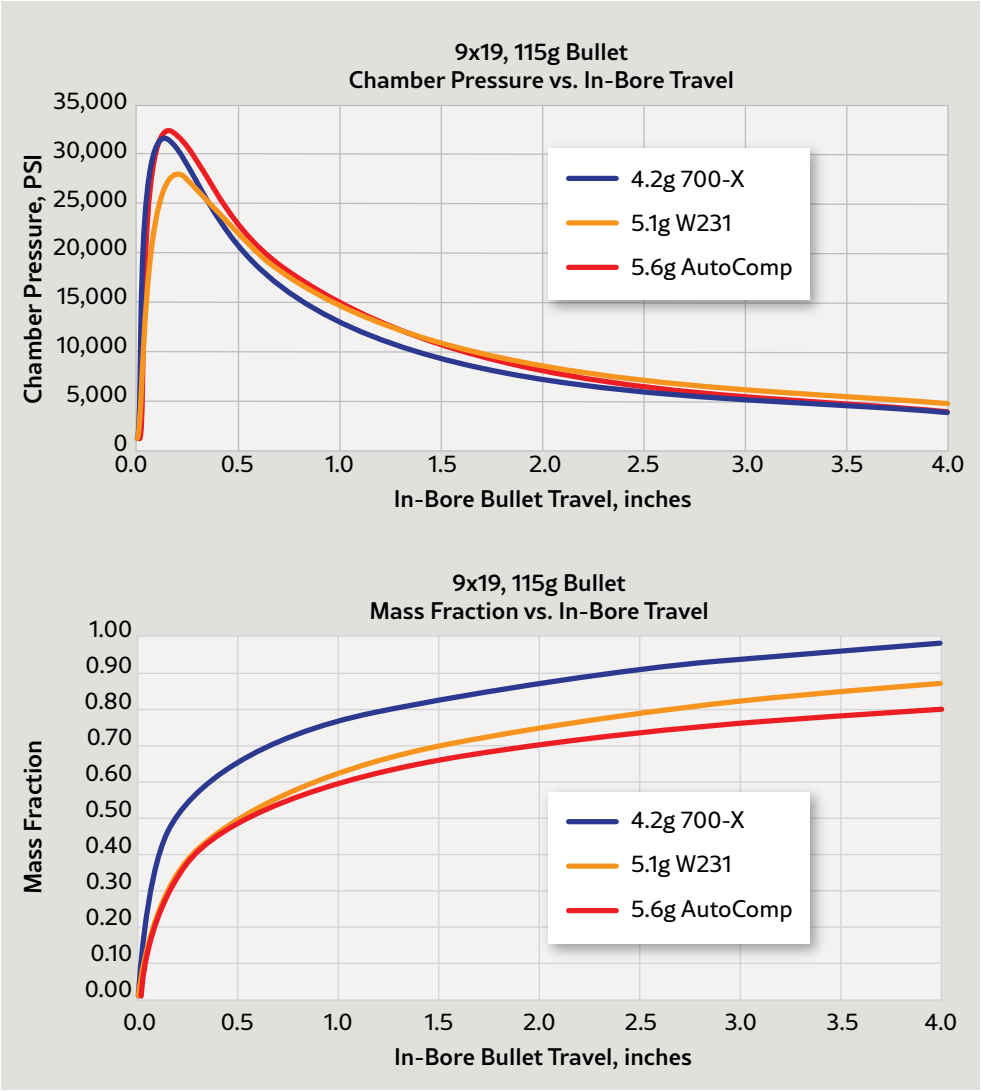

Figure 6: 9x19mm Chamber Pressure and Mass Fraction vs. Projectile In-bore Travel

propellants. The peak chamber pressure, a critical gun interface parameter, and the muzzle velocity from a pistol with a 4-inch barrel are listed.

Figure 6 shows the results of a simulation of a 9x19mm interior ballistics simulation using a lumped parameter interior ballistics code of 3 propellant loads for a 115g projectile. The peak chamber pressures for each of the simulated loads are fairly comparable, and the velocities of the W231 and the AutoComp propellants are fairly comparable (~1160 FPS) but the 700-X muzzle velocity is down considerably (~ 1095 FPS). However, neither the W231 or the AutoComp propellants are completely burned out as shown in the graph on the right-hand side of *Figure 6*, but the 700-X is almost completely burned out, due to the different burn characteristics of this propellant.

So, as long as the 1095 FPS muzzle velocity that comes with using 4.2 grains of 700-X propellant will cycle the pistol slide reliably, it would be a preferred choice for night firing or use with a suppressor as very little to no unburned powder exits the barrel. If the cost per pound (kilogram) of propellant is comparable among the powders, the lower charge weight of the 700-X makes it the leading choice among the powders presented.

Conclusion

The choice of propellant for a particular application depends primarily on the following factors of the weapon system under consideration:

- Peak Operating Chamber Pressure
- Expansion Ratio of the Firearm
- Propellant Charge Mass / Projectile Mass Ratio

Other factors, such as muzzle velocity performance, muzzle flash, temperature consistency, loaded cartridge cost, lot quantities, system function and casualty performance, and other considerations may influence the final choice of propellant for a particular application. SADJ

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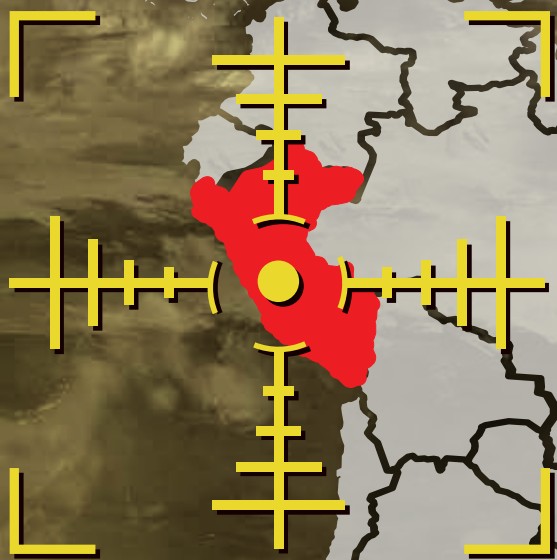

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Sabatti STR Ov

By Pierangelo Tendas

The ST-18 bolt-action long-range chassis rifle manufactured by Sabatti of Italy—known in the United States as the Sabatti STR Overwatch—offers interesting technical features and high-end levels of performance for law enforcement and tactical applications.

While not exactly a household name among shooters and professional operators in North America, the Sabatti S.p.A. company (headquartered in Gardone Val Trompia, the heartland of Italy's firearms industry) is a force to be reckoned with. As one of the oldest Italian firearms and barrel manufacturers still in production today, the company capitalized on centuries of experience to produce some of Europe's best-known hunting and precision sporting rifles. Approximately one decade ago, they decided to transfuse their knowledge into a new line of tactical precision rifles.

Sabatti manufactures all components for their rifles entirely in-house—with the exception of stocks, which are supplied under strict Sabatti specs by specialist makers from the same Val Trompia region.

The academic background of the current owner and CEO of the company, Emanuele Sabatti, as a mechanical engineer led to the entirety of the engineering work being internalized and now taking place completely in-house, with special attention to key components, such as barrels, actions and triggers, that other manufacturers may outsource.

Likewise, the Sabatti company takes particular pride in their manufacturing techniques and procedures, with the manual work of master gunsmiths going hand-in-hand with state-of-the-art CNC machinery and other industrial technologies; the result of this masterly mix of old-school and new-school gunmaking is a product line offering high levels of quality, accuracy and performance without reaching egregious price levels.

The ST-18 is Sabatti's first chassis rifle, developed in close collabora-

The result of our tests: the Sabatti company guarantees the ST-18 and MRR barrels capable of sub-MOA accuracy at 100m (approximately 109 yards) and we did find those claims to be truthful. The group in the picture has been attained at 100 meters with three rounds of Fiocchi Perfecta.

erwatch

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tion with BCM Europearms—another Italian specialized manufacturer of high-end bolt-action tactical and long-range competition rifles. It was first introduced at the 2018 SHOT Show, with an upgraded variant launched in 2021 following the feedback from a rich pool of faithful Sabatti users, chiefly long-range, precision sport shooters and professional operators. On the U.S. market, it is known as the Sabatti STR Overwatch, with STR standing for "Sabatti Tactical Rifle."

The Sabatti ST-18 rifle (a.k.a. STR Overwatch) is offered on the civilian and MIL/LE/Govt. markets. An excellent choice for long-range shooting competitions, it also covers all bases of modern urban marksmanship and countersniping for law enforcement applications, and is solid and versatile enough to serve the needs of military forces—both conventional and for special operations.

A Beast with Two Hearts

We often say that every firearm design has a "heart"—something unique and remarkable that makes it stand out among all others. If that's true, the Sabatti ST-18 has not one, but two "hearts": the action and the barrel, both unique to Sabatti's product line, engineered and manufactured entirely in-house.

The action of the Sabatti ST-18 is dubbed the "Blizzard," it is found on

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The Sabatti ST-18 is available in four calibers and three different barrel lengths. Note the "STR" rollmark on the receiver. In the United States, the rifle is known as the STR Overwatch.

numerous other models of the Sabatti product line and was specifically conceived for long-range shooting competitions. The use of a competition-oriented action in a tactical rifle is nothing new, but as history shows, it hasn't always been conducive to achieving the level of reliability and durability that a firearm built for military and law enforcement applications should offer. This, however, is where the ST-18 stands out

The bolt of the Sabatti ST-18 rifle is CNC machined out of special steel alloy and features three locking lugs and a 60-degree throw. The bolt body is subsequently heat treated and chrome lined until the desired level of thickness is achieved for a perfect match with the receiver—making it smooth, fast and, above all, silent to operate, eliminating all roughness.

The ST-18 bolt features three locking lugs (a Sabatti signature feature, not unique to the company but prominent on most of their product line) and a 17-4PH stainless steel extractor that was designed from the ground up to keep reliability even with high pressure loads. The company calls it a "guillotine extractor," given its form and function, and with the bolt closed it also works to support the case rim and prevent rupturing under high gas pressures.

A standard 5/16" thread at the end of the cocking handle allows the factory bolt knob to be replaced with any compatible aftermarket knob that

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The steel receiver of the Sabatti ST-18 is secured to the aluminum chassis by two contact points, leaving the action otherwise free to float—a system dubbed the "Suspended action" by the company.

may better suit the shooter's preferences.

When the ST-18 is cocked, the rear portion of the striker will protrude slightly from its seat in the bolt, acting as a visual and tactile status indicator. A two-position manual safety is located on the right side, just behind the cocking handle, and a bolt removal button is on the right side, in a customary position that most bolt-action rifle users will be familiar with.

The receiver of the Sabatti ST-18 rifle is machined out of a solid billet of high-strength, heat-treated steel with a full matte black finish and a 13-slot Picatinny rail for optics coming standard from the factory. Inclined 10 or 20 MOA Picatinny rails are available as factory options.

The bedding on the ST-18 is unique in that, like other Sabatti rifles, this one doesn't use a real bedding, relying instead on a new solution devised by the company and aptly dubbed *Azione sospesa* ("Suspended action" in Italian). Essentially, the receiver is coupled to the stock only through two screws, and doesn't enter contact with the stock itself anywhere else but in correspondence with these two interface points. The action is thus free to float within the stock, eliminating any level of coupling tension that could be detrimental to accuracy.

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The bolt, removed from the receiver. Lightning fast with a 60-degree throw, it also features an easily-replaced handle knob.

And Now, for Something Completely Different

As previously mentioned, Sabatti takes great pride in their barrel-making; this is particularly true when it comes to the type of barrel that equips the ST-18 and other entries in the company's current product catalog—the MRR barrels.

MRR stands for "Multi-Radial Rifling." First launched in 2011, MRR barrels are Sabatti's own development, covered by numerous international patents, and are unique to the Sabatti production, heavily featured

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The ST-18 features a two-position manual safety; the rear portion of the striker acts as a status indicator when the firearm is chambered and ready to fire.

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The ST-18 rifle features Sabatti's unique multi-radial rifling (MRR) pattern. The factory muzzle device can be easily replaced with aftermarket alternatives, including suppressors.

on the company's tactical and sporting long-range rifles. MRR barrels were developed with accuracy in mind, with the goal to achieve levels of performance that couldn't be matched by existing rifling patterns, including 5R, while at the same time allowing easy manufacture through cold hammer forging, a procedure that Sabatti has been mastering for decades and using for the entirety of their barrel production.

Multi-radial rifling (MRR) can be described as a "softer" rifling if compared to both standard and polygon rifling, in that lands and grooves aren't pronounced as one would normally find on a standard barrel. Additionally, MRR barrels feature a modified forcing cone geometry, providing for a better fit of the bullet to the rifling and alignment to the bore axis to begin with.

The MRR rifling is overall made to be a tighter fit on a bullet than the vast majority of conventional or polygon rifling patterns. When passing through an MRR barrel, the bullet will be deformed, ever so slightly (as the company stresses the low bullet deformation factor inherent to MRR rifling), but not cut, avoiding excessive levels of friction that may be detrimental to accuracy and service life.

Indeed, not only do MRR barrels require less cleaning and maintenance than standard barrels and deliver muzzle velocities that are higher on average than most of the competition's, but are guaranteed from factory to deliver sub-MOA accuracy at 100 meters with factory ammunition. We were able to verify that in our tests *(see photo)* with the Sabatti ST-18 and Fiocchi's Perfecta HPBT 186gr ammunition, a commercial version of the special load prepared by Fiocchi for Italian Army snipers.

The Sabatti ST-18 is available in three barrel lengths: 20", 24" or 26", in all available calibers. All barrels are cold hammer forged, protected by a matte black finish, and feature a 22mm diameter muzzle with a 5/8"x24 thread pitch. A 30mm muzzle brake is issued with every ST-18 and is easily replaceable with aftermarket muzzle devices—including silencers.

The 2021 iteration of the Sabatti ST-18 takes advantage of the feedback gathered by the company over a decade of civilian, military and law enforcement experiences with MRR barrels and features the new and improved twist rates developed for all

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Above: **The fully-adjustable folding stock is manufactured out of Ryton PPS polyphenylene sulfide (a high-strength, thermally-resistant polymer) and features QD sling swivel cups on both sides.** ***Left:*** **The stock folds to the right side for transportation or storage and can be replaced with an M4-type buffer tube and stock.**

available calibers: 1.11" for 7.62x51mm (compatible with .308 Winchester), 1:8" for 6.5 Creedmoor & 6.5x47mm Lapua and 1:8/¼" for .260 Remington.

Built for Stability

The chassis of the Sabatti ST-18 is entirely manufactured in-house on state-of-the-art CNC stations, machined from a solid billet of 7075-T6 aluminum alloy, also known as ERGAL-55 and called so chiefly in Europe. All surfaces are hard-anodized in black following MIL-A-8625 standards.

A magazine well is integrated in the chassis system. The Sabatti ST-18 feeds through detachable Accuracy International Chassis System (AICS) compatible magazines, with capacity ranging from five to ten rounds, depending on the caliber. 7-round magazines come from the factory with each rifle. The magazine release button is ambidextrous and located in front of the trigger guard, at quick and easy index finger reach for right-handed and left-handed shooters alike.

A free-float, machined aluminum Keymod-compatible handguard manufactured by Sabatti is standard with every ST-18 rifle. The rigidity of the overall package isn't tantamount to additional weight and thus detrimental to mobility: at 10.9-11.3lbs of overall weight (depending on the version), the Sabatti ST-18 remains highly-portable in most conditions.

The Sabatti ST-18 comes factory-issued with a FAB Defense AG-43 AR-15 storage pistol grip and with a buttstock of Sabatti's own design that's manufactured out of pow-

TECHNICAL SPECIFICATIONS

MANUFACTURER:	Sabatti S.p.A.
MODEL:	ST-18 (STR Overwatch)
TYPE:	Bolt-action rifle
CALIBERS AND RIFLING TWISTS:	.308 Winchester / 7.62x51mm (1:11"), 6.5x47mm Lapua (1:8"), 6.5 Creedmoor (1.8"), .260 Remington (1:8/¼")
ACTION:	TLD action – three front-locking lugs with 60° opening angle
TRIGGER SYSTEM:	Match-grade, three-lever
SAFETY:	Manual safety
CAPACITY:	AICS compatible magazines, available in different capacities
SIGHT SYSTEMS:	MIL-STD 1913 Picatinny rail for optics
BARREL:	20in, 24in or 26in 22mm diameter at the muzzle, MRR Multi Radial Rifling pattern
OVERALL LENGTH:	41.73in, 45.66in or 69.29in (stock open)
WEIGHT:	10.9-11.35lbs
MATERIALS:	Steel barrel, receiver, and action; reinforced polymer stock and pistol grip; lightweight aluminum alloy chassis
FINISHES:	Matte black finish on all steel surfaces; MIL-STD Type III hard anodized finish on aluminum surfaces

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We tried the Sabatti ST-18 with Fiocchi Perfecta factory ammunition, a commercial variant of the load used by Italian Army snipers, loaded with 168gr, HPBT Sierra MatchKing bullets.

dered, metal-reinforced Ryton PPS high-strength polymer, offering the necessary levels of durability, rigidity and stability for a sniper rifle buttstock while contributing to the overall low weight of the platform.

The buttstock folds to the right side for storage or transportation, and comes standard with QD sling swivel cups on both sides and a fully adjustable cheek riser. A set of rubberized spacers can be used to adjust the length of pull. The stock can also be removed from its interface, revealing a threaded attachment point for an AR-15/M4 buffer tube that will allow shooters to swap the factory stock with any M4-compatible buttstock. Similarly, the pistol grip can be swapped with any AR-15-compatible aftermarket alternative.

Last, the chassis also integrates the factory trigger, another of Sabatti's own designs, a Match-grade three-lever trigger that breaks at an average weight of 600g (approximately 21.1oz). As of today no major aftermarket supplier manufactures triggers that are compatible with Sabatti rifles, but the features and performance of the Sabatti factory Match-grade three-lever trigger are on par with those that sport shooters, hunters and professional operators worldwide have come to expect from names like Timney or Elftmann.

Up There with the Big Boys (at a Fraction of the Cost)

Available on the European markets at an MSRP of € 1,859 and sold on the U.S. commercial market as the STR Overwatch at an average price of approximately USD $1,400 (current listings at time of writing) the Sabatti ST-18 is also one of the more affordable multipurpose bolt-action precision rifles currently available for civilian and professional sales on both sides of the pond, as well as one of the most enticing marketwise, given the plethora of factory features that it offers.

As of today, the Sabatti rifles haven't been met on the U.S. market with the recognition they would deserve and that's a pity, because the unique nature of the proprietary technical features found on Sabatti's products are certain to give the big names a serious run for their money—they already do in both Western *and* Eastern Europe, where Sabatti rifles enjoy a better share of popularity, and when it comes to competitions, more often than not you'll find them on the top steps of the podium.

It is true, indeed, that the availability of Sabatti rifles in the United States has not been as exhaustive as shooters and professionals may have expected. But that may be about to change, and when it does, the Sabatti ST-18 (a.k.a. STR Overwatch) will be there, ready to take the big boys head-on. SADJ

What Makes Am

By Jay Bell

Military Specification Ammunition, a.k.a. "Mil-Spec Ammo," has attained a level of mysticism in some circles in the commercial ammunition world. Many training groups (and some other groups) will only run Mil-Spec in their weapons. To them, it is worth the extra cost to ensure consistent performance. What differentiates Mil-Spec from commercial ammunition? Is it any better than commercial-spec? Let's dive into this extremely technical topic and I'll try to break it down.

The reasons for having Mil-Specs go back to the Civil War and the creation of the False Claims Act (FCA, a.k.a. the Lincoln Law). Both the Union and Confederacy were being taken by false goods—sawdust instead of gun powder, blind mules and rifles that would not fire. Then this law was enacted by honest Abe Lincoln and the situation got better. Fast forward through

The headstamp markings provide essential information about the cartridge. In this example, the "LC" is Lake City, "18" is 2018 (year of manufacture) and the "+" is the NATO cross. The presence of the NATO cross on the headstamp always indicates that a cartridge meets Mil-Spec.

mo Mil-Spec?

around 100 years of the USG developing and growing Mil-Specs and things got a little out of control. This resulted in numerous exposés over $200 hammers and $600 toilet seats in the 1970s and 1980s. In 1994, Defense Secretary William Perry made a directive to procure commercial off-the-shelf (COTS) as much as possible, then things reeled back a little. Since that time, the market has readjusted and now we are heading back towards overkill and the $200 hammer.

Having spent the better part of 30 years in defense contracting, I can easily see how a $15 hammer could cost $200. It all depends on the supporting requirements and documents the contractor is required to complete as part of the contract.

- Option 1: Require the contractor to complete a full test spectrum on 100 hammers. The hammers cost $15 each ($1,500 total), the test costs $18,500.

Figure 1

Document #	Title	Page Count
Mil-A-48078	Ammunition, Std Quality Assurance Provisions, General Specification for	15
Mil-STD-105 Replaced by Mil-STD 1916	Quality Assurance Inspection quantities	33
Mil-STD-109	Quality Assurance Terms and Definitions	38
Mil-STD-636	Visual Inspection Standards for Small Arms Ammunition	113
Mil-STD-644	Visual Inspection Standards and Inspection Procedures for Inspection of Packaging	101
Mil-STD-1168	Ammunition Lot Numbering	63
Mil-STD-1170	Visual Standards & Comparison Methods for Evaluation Grain Configuration in 7.62mm Cartridge Cases	12
SCATP-7.62	Ammo Ballistic Acceptance Test Methods, Test Procedures for 7.62mm Cartridges	219

Total cost: $20,000, or $200/hammer.

- Option 2: Have hundreds of pages of documents required with 100 hammers. The hammers cost $15 each ($1,500 total), the paperwork costs $18,500. Total cost: $20,000, or $200/hammer.
- Option 3: Require the contractor to get the hammers anywhere in the world in 24 to 48 hours. The hammers cost $15 each ($1,500 total), the expedited shipping $18,500. Total cost: $20,000, or $200/hammer.

And so on. Fear not, concerned taxpayer! Most USG contracts have a limit of 15% profit, per the Federal Acquisition Regulations (FAR). Of course, who has the time to bean count every contract? However, competition keeps the players honest to the best extent possible. In the examples above, most likely none of these contractors made more than a 15% profit—they just wasted a lot of money.

What about military specifications and what those weapons and ammunition are subject to in order to reach approved acquisition by our armed forces? Military Specification circa the 1990s *used to* mean submitting piles of drawings and detailed specifications on how to manufacture the ammunition. The drawings are the easy part, as nearly all ammo components are made to a drawing. The specifications are where it gets interesting. If we dig into all the other details of what makes Mil-Spec ammunition different, we will see the unique materials that make it superior (and more difficult to manufacture).

The Paper Chase

The specifications are numerous and massive. The old spec for the M80 ball was once known as Mil-C-46931, now Mil-DTL-46931. It was a 31-page document that called out the pressure and velocity, key attributes and more. It called out the testing requirements for the First Article Acceptance Test (FAAT/FAT) and Lot Acceptance Tests (LAT). It also references dozens of other specs in order to meet all aspects of the requirements. *Figure 1* (see page 58) identifies some of the key documents and their approximate page count.

This is just for the complete cartridge. There is a similar specification for the cartridge case and the projectile/bullet. There is another specification for the propellant, the wood wire-bound crate, the ammo can, the links and many more. The pages listed in this chart total over 500 pages. If we added in all the specs for all the elements, it would easily total 1,500 pages.

The New Level of Detail

As if the aforementioned is not daunting enough, the trend since after the 2nd Iraq War in the 2004 timeframe is to 100% solidify the manufacturing process with written details and pictures for each step of the manufacturing process. Prior to 2004, written procedures were enough. Some of these procedures were very simple and about as basic as one can imagine. After 2004, the procedures are preferred to have detailed visual aids (a.k.a. pictures). These pictures have "GO" and "NO GO" recommendations to try to ensure consistency and repeatability in the process. This trend is a combination of fuller use of ISO-9000-type standards and combining those with the Mil-Spec. For example, a contractor-required Clause – Contract Data Requirements List (CDRL) must document how they will measure the 7.62 M80 cartridge in detail. This written and multiple-page document is called the Acceptance Inspection Procedures (AIE), or Measurement System Evaluation (MSE). Prior to the 2004 timeframe, the inspection plan document would have stated that you were going to measure the length of the cartridge with a digital caliper and that would be the end of it. Now you need to:

1. Call out specifically what brand and model of digital caliper you plan to use.
2. Reduce the tolerance from the drawing (2.80-.030) limits to allow for error in the equipment (2.799-.028).
3. Train the staff to the procedures (including all revisions).
4. Document the training.
5. Use the written procedure for inspection.
6. Edit as required, re-train, re-document, etc.

If you don't do all of this perfectly you will find yourself with a Corrective Action Request (CAR) from your local Defense Contract Management Agency (DCMA) local Quality Assurance Representative (QAR) or your government customer. I still remember running government LATs in the 1990s where the QAR just had a black book and wrote down only a summary of the test (i.e. pass or fail, average velocity, etc.). Our LAT report was a one-page document summarizing all the key events and data. I am aware of recent LAT reports for a single cartridge item being as large as 50 or 60 pages. The crazy part is that the documents themselves have not changed much since then, what has changed is the *interpretation* of the documents and what is expected to be compliant with the specifications.

Interpretation

This word has become the "catchall" to allow the government to fine-tune the documents to their muster. The government is the customer and all elements/groups of the customer get to weigh in on what is a passing system to accept the product. This means the engineering group in one part of the country and the buying group in another part can influence to get the results they want. The government customer typically delegates to the local QAR to be the local "boots on the ground" and witness the local inspections and FAT/LAT. However, it's not uncommon (pre-COVID) to have

Figure 2

System	Resolution	Repeatability	Accuracy
Digital Micrometer	.00005	.00005	+/-.00005
Digital Calipers	.0005	.0005	+/-.001

the agency customer send an additional government representative to witness the FAT or LAT.

Since all these customers come from different backgrounds and experiences, it is literally approval by a committee of several people. This results in the challenge of having to please multiple masters. If you have a player on the team that is used to dealing with extreme precision, they are going to push for extreme precision in many areas. It comes back to the interpretation of the key players how extreme you will need to be on measurements. This brings up the subject of accuracy and repeatability of the measurement system.

Accuracy and Repeatability

As mentioned earlier, the system now needs to account for potential system errors. All inspection equipment has an accuracy that will indicate how accurate the measurement system is unto itself. For example, *Figure 2* (see page 59) shows the standard information included with some typical measurement equipment.

It is obvious that the micrometer is the better choice from the data above. However, in the Mil-Spec world, there is another factor to consider—tolerance range. In the government inspection world, these two different gages give you massively different ranges of acceptable dimensions. For example, the head diameter on the drawing is .473-.007 inch. This would be changed for inspection purposes to be .4695+/-.0035.

Most people would assume that measuring with the digital calipers would be the fastest measurement, and accurate enough. However, using the micrometer to take in the accuracy we would need to take into account that the measurement could be .00005 off in each direction. This results in losing .0001 of the tolerance. However, the calipers' accuracy of .001 results in losing .002 on the total acceptable tolerance of the part.

This probably does seem like a big deal, just measure with the micrometer. Measuring with a micrometer is more time-consuming and takes a more skilled inspection staff. Also, if you are measuring Mil-Spec quantities of hundreds of parts, this can add up and increase your inspections. Wait, what about automated inspections? That will solve the problem. Sure, these are great for a double-check, however, most of the automated systems have the same issues as the micrometer versus the calipers—accuracy. There is an entirely different process to approve Automated Acceptance Inspection Equipment (AAIE). Once you have been through this once, you might consider going back to non-automated. See *Figure 3* on page 59.

Critical Characteristics Clause 52.246-4553

This clause is the big one. When this clause is on the contract, you are essentially shooting for 1 defect per million parts, for each critical characteristic of the cartridge. So, on some items, these stack up and you are shooting for 1 defect in *x* million rounds. Things like powder charge being too far out of the target range or inverted primer could be a critical defect. In many cases, finding one of these in a Lot Acceptance Test (LAT) would be grounds for rejection of the lot and it is sent to "commercial" status.

Commercial Comparison

So how does this level of detail compare to the commercial world? Most of the major ammunition producers have drawings for all raw materials and written procedures throughout the process. They have "industry standard" methods of test and measurement that are close to Mil-Spec, just not to the level of scrutiny of Mil-Spec. A Production Part Approval Process (PPAP) is common in automotive manufacturing and some manufacturers use something very similar. I think the *biggest* difference is usually the manufacturer designs and develops their PPAP and the customer can accept or reject all the steps and tests. In the Mil-Spec world, the PPAP equal is required to be submitted and approved by the government committee. This makes it much more difficult.

I don't believe any inflict the critical defects clause on themselves. In reality, many major manufacturers are probably around 25% of the paperwork, as compared to Mil-Spec. For many products, a well-set-up system (robust) could produce ammo that would be on par with Mil-Spec. Most major manufacturers have government contracts or are using government methods as a guideline. A huge difference is if/when the product deviates from the internal specification, you don't need 5 different committee member signatures to allow for the deviation. This system is good for serious issues, like the ammo having excessive pressure. It is not so good when a lot is rejected because the micrometer was 1 day out of annual calibration.

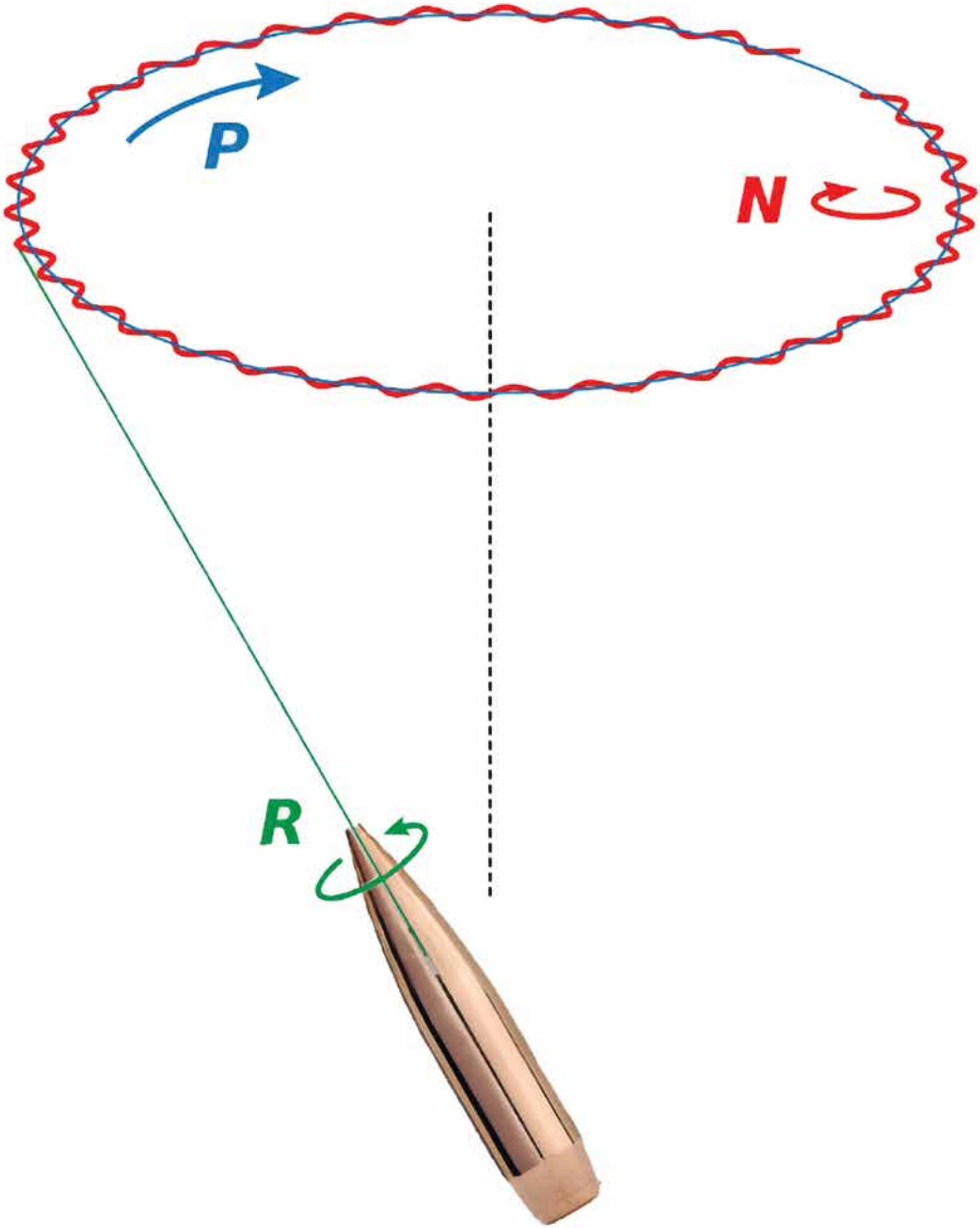
Which Is Better?

Hands down, Mil-Spec ammo is better than commercial. However, some manufacturers have some of their non-Mil-Spec processes dialed in and they can go head-to-head with Mil-Spec. It is really to be judged on a case-by-case basis. Secondly, you need to make sure you are really talking about Mil-Spec, via certification and/or test report. In the past, people would say "Lake City Mil-Spec" as if all ammunition from Lake City was Mil-Spec. Lake City makes a large amount of Mil-Spec ammunition, however, not all of it is Mil-Spec. They do sell commercial-grade ammo. They have also sold components for others to load, which could consist of a Mil-Spec case and a commercial loading process. There is also ammunition that is "pull down" from rejected lots of ammo. These components are sold and reloaded and are clearly not Mil-Spec.

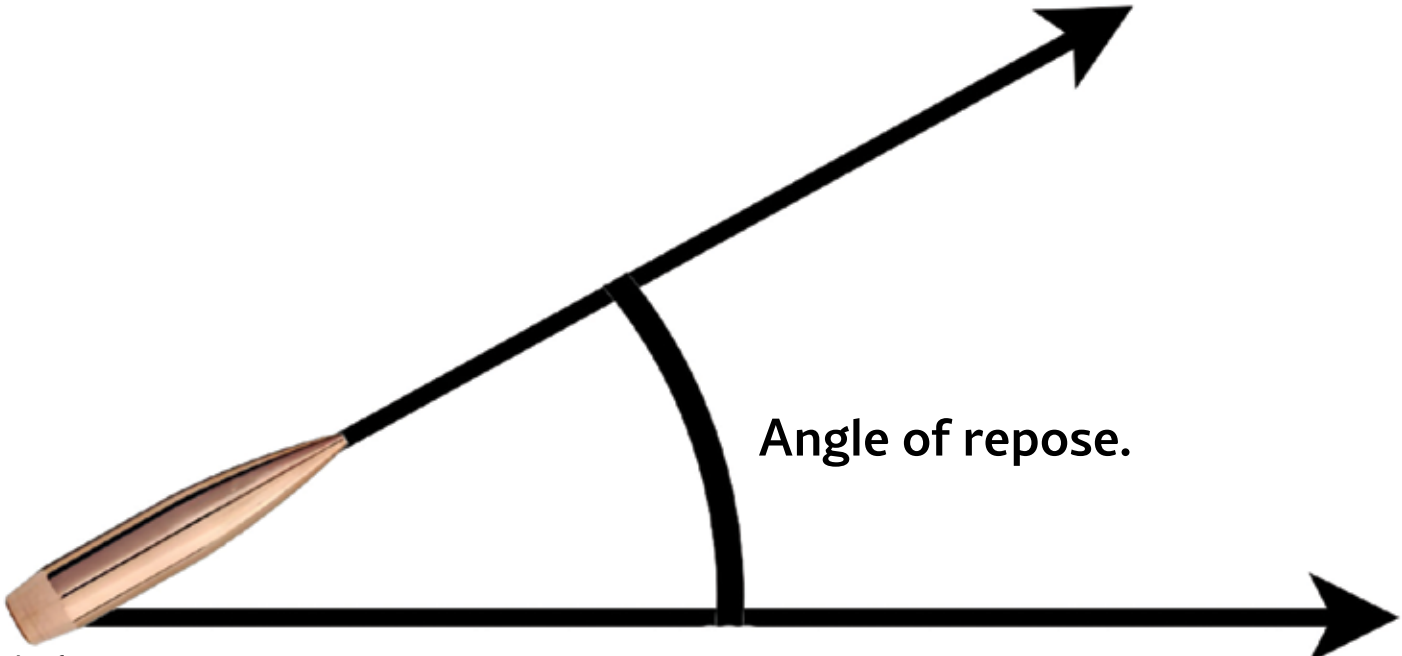
Now that you know the difference, best of luck finding Mil-Spec or commercial ammunition for the foreseeable future! SADJ

Figure 3

Dimension	Measurement High	Measurement Low	Total Range
Head Diameter – Drawing	.473	.466	.007
Head Diameter – Adjusted for Accuracy micrometer	.47295	.46605	.0069
Head Diameter – Adjusted for Accuracy digital calipers	.473	.467	.005



Rotation (green), precession (blue) and nutation (red) in obliquity of a projectile.



Angle of repose.

Twist Rates and the .338 Norma

By Ward W. Brien

Science and math, due to their principled foundation, deliver truth and also determine barrel twist rate. Experienced barrel makers who have been making barrels for decades, such as Chanlynn, Hart, Rock Creek or Krieger, have kept records for what twist rates have worked best for particular bullets. However, as barrel makers, they are also familiar with "Miller's Twist Rule." This mathematical formula calculates an optimum twist rate for any given bullet.

I recently watched a video of a shooting instructor taking it upon himself to instruct his students about bullet "twist rates," and what the bullet does once it leaves the barrel. He improperly used terminology, such as "bullet tumble," giving a purely fictional presentation.

Regarding bullet tumble—they don't. Bullets *can* make an exaggerated "J" turn due to spalling when hitting a target as the heaviest part of a bullet is in its tail end, however, they do not tumble.

If the bullet travels a far enough distance, it will progress beyond a precessive state and cessate. Cessation is when the bullet "surrenders" to the forces of physics while in a precessive state. As the bullet precesses more and more and depreciates in velocity, it will eventually rotate 180° about its "Z" axis, with its tail end pointing towards the target.

Secondly, the precession of the bullet occurs from the beginning stage of the trajectory and never goes away. The nutation and changing angle of repose will depreciate to a relatively small amount, however after a short distance, the precession will in fact continue to grow larger and larger. As an example, when shooting a .308 Winchester (with twist rates at or larger than 1:11") a 168 grain SMK will appear to "keyhole" at approximately 1,000 yards when it hits the target. The projectile is not flying sideways, but rather gyrating about its axis in an advancing precessive state.

Factors such as density altitude, drag and the bullets shock wave, along with other exterior influences, all play a role in the different stages of this process. Imagine, if you will, a fast-spinning top—you will notice that it always has a little wobble in it. Although as long as it is spinning fast enough, the top will remain upright. However, as the top slows down, you will notice that it wobbles more and more. This represents precession. Once the top slows down enough, it falls over. This represents cessation. If you understand how the projectile functions along its trajectory and interacts with the exterior elements, you can add in other pieces of the puzzle that contribute to the "one round one down" philosophy. Everything has an equation.

Being aware of some of the science behind the shooting, I have always (as

2009 International Sniper Competition at Fort Benning.

you probably have, too) sought out the best-performing cartridges. There had to be the best 1,000-yard bench rest cartridge and the best predator cartridge, etc. Then, one day back in 2008, I found, for "me," the best cartridge for shooting in a mountainous environment, and that was the .338 Norma.

The mountains can be a tricky shooting environment. The complex, multi-layered and multi-vectored winds can make it very challenging and punching through them takes a unique combination of bullet type, bullet weight, ballistic coefficient, twist rate and velocity—"Moment." The math and science will prove it, although shooting the different cartridges on the flat square range and then at altitude in the mountains will confirm it. Whether on a flat square range or in the mountains, the .338 Norma, utilizing a 300 grain Lapua Scenar or Sierra Match King, delivers phenomenal accuracy and performance. (1,400+ fps with an accompanying 1,400+ foot pounds of energy at one mile; 1,609 meters or 1,760 yards.)

When I built mine in 2009, I was so impressed with it (and proud of it) that I took it to the International Sniper Competition at Fort Benning. During the "vendor shoot day," I shot it with the current President of the U.S. Army Sniper Association, Stan Earl Ellis, and others. All are former U.S. Army Snipers and Sniper Instructors.

The .338 Norma is my all-time favorite cartridge! But how did the science of it all come together to produce it? Well … meet Mr. Michael Brown, owner of Mike's Gun Sales & Service (and also Jet Suppressors). Although there were other people involved with the project, Mr. Brown provided the machine shop, machining, testing and overall research and development. In my opinion, he was/is the nucleus of the .338 Norma and .300 Norma project.

I met Mike about twenty years ago at SHOT Show. He is a "rifle maker" who also manufactures titanium suppressors, handguards, Picatinny rails, bottom metal, muzzle brakes and other products for other firearms manufacturers. One of his clients at the time (pre-2005) was Rock Creek Barrels.

Design History

Pre 2005, the .338 Norma project was called the "338 R." It was a collaboration between Rock Creek Barrels and Jimmie Sloan. This project was a known attempt within the U.S. military to improve upon the .338 Lapua and function within the 700 long action's M24 platform.

Back in 1985, the .338 (not yet the .338 Lapua), was a U.S. Air Force project, with the intent of creating a new cartridge to protect their air fields, and the 250 grain Sierra Match King was the chosen bullet. However, after certain circumstances prevailed, the cartridge was abandoned.

The idea of creating a cartridge that would perform better than the .338 Lapua, and be designed to utilize the 300 grain SMK and function within the M24 platform, was brilliant. Sloan and Rock Creek Barrels began the process. Once the first .338 "R" was completed, it was delivered to the U.S. military for initial T&E. The results were promising, however, the general support was not there. At the time, it was considered to be a "wildcat" cartridge, as the brass was all hand formed from the .338 Lapua.

Stars of Destiny Align

As Mr. Brown lived/lives in Aransas Pass, TX and the conceptualist lived in Texas and the .338R project was in need of a unique individual who could assist in the engineering of the cartridge, the stars of destiny aligned.

There is quite a lot to the devel-

.338 Norma built by Mike Brown.

opment process and I would like to mention a few. Mr. Brown spent years working on this project with some of his contributive engineering and testing consisting of: chamber and reamer design, pressure testing, powders, powder burn rates, throat length, throat erosion and barrel life, as well as polymer cases, .338 armor-piercing bullets, metallurgy, thermal stability and barrel *twist rates*. His efforts of the design build process were enormous and, in my opinion, if there wasn't a Michael Brown, there would not be a .338 Norma, .300 Norma or another secret Norma in the vault ready to go.

Barrel twists and twist rates are a particularly interesting topic.

Lands

The lands are the raised areas in between the grooves in the interior of the barrel, which causes the bullet to rotate down the barrel and spin as it leaves the muzzle. This spin serves to gyroscopically stabilize the projectile by conservation of angular momentum, improving its aerodynamic stability and accuracy.

The grooves and shape of the lands are accomplished by one of five machining processes that barrel manufacturers utilize and are as follows:

- **Single Point Cutting, (Hooks):** This is the preferred method by many barrel makers where the material, steel, is removed from the interior of the barrel one pass at a time. What makes this method unique is that minimal stress is placed upon the barrel's steel. Steel does not cut or react like wood—it moves with the heat and must be addressed from a truly professional approach.
- **Broach Rifling:** The modern broach method of rifling uses a hardened steel rod with several cutting rings spaced down the rod. Broaches can be over 16 inches long and, because they have several cutting rings, they are referred to as "gang broaches."
- **Button Rifling:** Probably the most common method used today to rifle barrels is button rifling. Button rifling uses a different approach to forming the grooves in the barrel. A button is a very hard steel plug that is forced down an unrifled barrel. The grooves are then formed in the barrel under very high pressure. The pressure created to form the rifling in the barrel hardens and polishes the inside of the barrel.
- **Hammer Forged Rifling:** The newest mechanical method of rifling barrels is accomplished through a process called hammer forging. Hammer forging produces a type of rifling called polygonal rifling. A hardened steel mandrel is produced with the shape of the rifling formed on its outer surface. The mandrel is inserted into a barrel blank and the outer surface of the barrel is machine hammered. The hammering forces the barrel material down against the mandrel and the inner surface of the barrel takes on the shape of the mandrel. The mandrel is then removed from the barrel and the outer surface of the barrel is cleaned up. Just as in the other types of rifling, polygonal rifling can have different patterns. The most common polygonal patterns are 6/right and 8/right.
- **Electrochemical Rifling:** In a process that eliminates the conventional machining of metal, rifling is formed by wet-etching the interior of a barrel under an electric current. The metal inside the barrel is actually eaten away or dissolved to create grooves in the barrel. An electrode (cathode) that has metal strips in the shape of the rifling is placed in the barrel (anode) and the assembly is submerged in a salt solution. An electric current is applied and the electrode is moved down the length of the barrel and twisted to create the spiral shaped grooves. As the current trav-

Early .338 Norma receiver.

.338 reamers, circa 2007.

els from the barrel to the electrode metal is removed by electrolysis, thus forming the grooves in the barrel. This process creates the rifling in the barrel very quickly and does not require consumable tooling.

Rock Creek Barrels was the chosen supplier and their 5R was the barrel of choice. But what exactly is the 5R?

In addition to an old British Patent for a rifling head that resembled the 4R (4 Russian) pattern of rifling, the Russian barrels were being hammer forged and the land design was "slope-sided" or "chamfered."

Sometime in the 1970s, Mr. Boots Obermeyer, who was a renowned barrel manufacturer out of Wisconsin, began manufacturing his version, which was the 5R (5-Russian with 5 grooves). Mark Chanlynn (Rocky Mountain Barrels), John Krieger (Krieger Barrels) and Mike Rock (Rock Creek Barrels) all apprenticed under Mr. Obermeyer and were keenly familiar with the design.

In business for himself, Mr. Krieger soon began manufacturing 5R barrels, as did Rock Creek. However, the Rock Creek version of the 5R has a different meaning. The "R," according to a direct conversation between Rock Creek Barrels and Mr. Brown, stands for "Radius." The lands of his barrels are radiused, not sloped-sided or chamfered. However, there is a twist to the story. Rock Creek also conveyed to Mr. Brown that the barrels that were originally supplied to the .338R project were also "gain twist" barrels. As an example, a gain twist barrel means that the twist rate may arbitrarily be 1:12" (one twist every 12") at the breach, and uniformly increase to 1:9.3" 50% into the bore. The general idea of a gain twist was to allow the projectile to somewhat ease into the full specified twist. The Rock Creek Barrels were Mr. Brown's number 1 choice as they were very accurate and produced higher velocities than the other barrels. However, the optimum twist rate for the .338 Norma was locked in at 1:9.3" exactly. Because of the gain twist, Miller's Twist Rule applies only as a guideline.

With all things considered, this process gets more interesting. A specified twist rate of 1:9.3" in a Rock Creek barrel is 1:9.3". However, this is not usually the same with other barrel manufacturers. If I request a .338 barrel from a barrel maker, he may only be able to provide me a 1:9.1" of twist because the gearing of certain barrel making machines cannot match the requested 1:9.3" twist rate. Other barrels may arrive from other barrel manufacturers with a twist rate of 1:9.8" or something else altogether. Mr. Brown uses different barrel manufacturers and, as each barrel of the same caliber can have a slightly different twist rate, he has them written in Sharpie on his work bench.

As you can see, cartridge development is a tremendous undertaking. Mr. Brown was the right man in the right place at the right time. He engineered the .338 and .300 Normas around the bullet and the many iterations and build cycles required great expertise and patience. Barrel twist? It's a large part of an even bigger picture. SADJ

WEBSITES OF INTEREST

Mike's Gun Sales & Service / Jet Suppressors
jetsuppressors.com

Sniper Tools Design Company
snipertools.com

Schmidt & Bender
schmidtundbender.de/en

McMillan Fiberglass Stocks
mcmillanusa.com

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SIG Custom Works made sure the P320 AXG Scorpion is very distinctive among its P320 brethren, not only aesthetically, but also with added features.

Jewels in the Crown

SIG SAUER's P320 AXG Scorpion & P365 Nitron Micro-Compact

Story & Photography by Todd Burgreen

SIG SAUER® (SIG) is renowned for not resting on its laurels. Always pushing the envelope, SIG is either introducing new variants of already-successful weapons or bringing new designs to life in the quest to scratch everyone's "itch" whether it's SMG, rifle (bolt action and gas operated), belt fed machine gun or handgun. The P320 and P365 pistol product lineups back up this statement. These two handgun models have solidified SIG HQ in Exeter, NH as ground zero of the current handgun universe. The P320 AXG Scorpion and P365 Nitron Micro-Compact (P365) will be studied in depth to help explain SIG's preeminent position.

The P365

The P365 was SIG's big splash at the 2018 SHOT Show. The market soon rewarded SIG's design thought process by making the P365 the best-selling handgun in the U.S. A hotter niche in the handgun market right now than "slim, subcompact 9mm autos" would be tough to name. SIG loaded the P365 with features such as XRAY3 Day/Night sights, a 10-round flush fit magazine with optional 12- or 15-round extended magazines also available. The 17-ounce P365 is striker fired. The P365 is chambered in 9mm and is rated for +P ammunition. The SIG P365's key to success is in its magazine design. SIG made the P365 as thin and as small as most polymer frame single stacks with a capacity equal to double stack weapons.

After some teething troubles with early P365s that SIG rectified quickly, the P365 has proven reliable, accurate, tough and simple to operate—all at a very competitive market price. A review of personal defense handgun market makes it clear that the SIG P365 is the design standard that the others are now chasing. Its 4.3-inch height, while maintaining a minimal profile of approximately 1 inch, is important for concealed carry consideration, especially with IWB.

The P365 is in response to the U.S. concealed carry market that continues to expand and generate firearm sales. All civilian practitioners of concealed carry want to carry the most potent handgun they can carry comfortably while still handling proficiently. Unfortunately, constraints caused by weather, clothing or social environment can preclude this at times, forcing a compromise in terms

The compact P365 breaks down simply into four major pieces: frame, slide, barrel and dual recoil spring.

of size and caliber. With the P365, SIG has created a slim, petite, compact polymer handgun chambered in 9mm. The P365 has XRAY3 Day/Night sights, combined with a trigger and overall "feel" conducive to accurate fire more typical of full-size handguns. This instills confidence that the P365 is capable of performing past "bad breath" distances if needed. SIG SAUER, through savvy design, was able to duplicate the ergonomics and natural pointability of their larger models in the P365 package.

P320s and the AXG Scorpion

The polymer striker-fired SIG P320 has quickly evolved into an industry leader for duty and personal defense handguns after arriving on the scene in 2014. Its selection as the U.S. Army's new sidearm via the Modular Handgun System (MHS) procurement solicitation a few years later solidified this position. This was followed soon after by all other U.S. branches of service adopting the P320 in its M17 or M18 form. The new P320 AXG Scorpion (evaluated herein) brings a heightened level of performance to the P320 lineup.

A SIG SAUER Custom Works offering, the P320 AXG Scorpion falls into the SIG X-Series of P320s. SIG Custom Works made sure the AXG Scorpion is very distinctive among its P320 brethren, not only aesthetically, but also through added features. The P320 AXG Scorpion arrives with three (3) 17-round magazines placed inside a Custom Works case featuring Challenge Coin and Certificate of Authenticity. The pistol features a metal alloy

SIG SAUER is renowned for not resting on its laurels. The P320 AXG Scorpion and P365 Nitron Micro-Compact (P365) help explain SIG's preeminent position in the current handgun market.

grip module. The metal grip module adds 3.2 ounces of weight to the Scorpion compared to a similarly-sized SIG P320-M18 with polymer frame. Other P320 AXG Scorpion characteristics include: Custom Hogue G10 Piranha side grip panels/rear backstrap, FDE Cerakote finish, X-Series flat skeleton trigger, XRay3 Day/Night sights with U-notch rear, and XSeries Optic Ready Slide (compatible with SIG Romeo 1PRO, Leupold DeltaPoint® Pro and Trijicon RMR red dots). The ability to easily mount a red dot optic on the SIG P320 Scorpion is a sure sign of the times. Red dot use on handguns is spreading rapidly to everyday personal defense, law enforcement and military weapons.

The heart of all SIG P320s is the fire control mechanism, or "chassis." The chassis is considered the pistol and bears the required serial number marking. The fire control chassis fits into a grip module. The chassis is the key allowing for the SIG P320's modularity between different models slides and frames. The chassis contains the trigger mechanism, hammer and slide catches. The slide assembly does not interact with the grip module, but is guided/operates along the chassis' integral steel rails located on both sides of the chassis front and rear.

You do not have to reinvent the wheel to have a successful new model. There are currently thirteen P320 variants listed on the SIG website. The SIG P320 AXG (Alloy XSeries Grip) Scorpion is the newest entry. The P320 has always attracted admirers, thanks to its ergonomics. For example, its grip angle found favor with many who argue it offers better natural point of aim than some striker-fired competitors. Thankfully, SIG maintained the grip angle with the AXG Scorpion's alloy frame module—they focused on other tweaks, such as the SIG XSeries straight trigger, beveled four sided internal magazine well, undercut trigger guard, extended beavertail and sights.

The 3.2-ounce difference in weight generated by the AXG Scorpion's alloy frame generates a distinctive positive ergonomic feel that will appeal to many. What could be better than a proven striker-fired handgun exuding the classic feel of metal in your palm? The AXG Scorpion's generous undercut and extended beavertail immediately sent positive signals to the right side of my brain.

Testing

The best way to learn or appreciate a product is to use it unhindered over an extended timeframe. Numerous holsters from both Galco and DeSantis were utilized with the P320 AXG and P365. Numerous Inside the Waistband (IWB) and belt holsters are available from Galco and DeSantis. For the P320 AXG, Galco features the Paragon IWB along with Combat Master belt holsters. The KingTuk IWB is one of Galco's offerings for the P365. DeSantis is in the mix with the Speed Scabbard belt holster and Cozy Partner IWB for the P320 AXG. The Slim-Tuk IWB and recently introduced Variable GRD for the P365 are DeSantis offerings. These combination of holsters were used for daily carry and numerous trips to the range.

The P320 AXG Scorpion is a SIG Custom Works offering and falls into the SIG X-Series of P320s.

SPECIFICATIONS

SIG SAUER P320 AXG Scorpion	SIG SAUER P365 Nitron Micro Compact
CALIBER: 9mm	**CALIBER:** 9mm
MAGAZINE CAPACITY: 17 rounds (3 magazines provided)	**MAGAZINE CAPACITY:** 10 rounds (2 magazines provided) 12- & 15-round extended magazines available
BARREL LENGTH: 3.9in	**BARREL LENGTH:** 3.1in
OVERALL LENGTH: 7.4in	**OVERALL LENGTH:** 5.8in
SIGHT RADIUS: 5.8in	**SIGHT RADIUS:** 4.9in
HEIGHT: 5.5in	**HEIGHT:** 4.3in
WIDTH: 1.3in	**WIDTH:** 1.06in
WEIGHT EMPTY: 31.3oz	**WEIGHT EMPTY:** 17.8oz

No malfunctions with the SIG P320 AXG Scorpion or P365 were experienced during range visits to Echo Valley Training Center (EVTC). Each pistol had over 300 rounds fired. A can full of assorted ammunition, ranging from steel, aluminum and brass case loads was used. Magazines are loaded with these random loads as a sort of reliability proofing. SIG SAUER ammunition was prominent in the T&E: SIG Elite 147 grain and 115 grain V-Crown, 115 grain V-Crown Competition and 124 grain FMJ. The specially-tailored SIG concealed carry SIG 365 115 grain loads were a no-brainer considering the P365 handgun present. The SIG 365 ammunition is optimized for use in short barrel pistols via powder producing less flash and recoil while still maintaining V-Crown hollow point performance.

Multiple scenarios involving shooting/moving, engaging multiple targets behind barricades while switching magazines, working in/around a vehicle and steel plate rack left no doubt of both pistols' potential. SIG SAUER XRay3 Day/Night sights provide aiming solution, no matter what light conditions each weapon was used in. The sights are also proficient in providing stand and deliver accuracy at distance.

The P320 AXG Scorpion instills confidence with how it stacks hits on targets that result in jagged holes. The P320 AXG Scorpion's SIG X-Series straight trigger offers a 90-degree break for better geometry and less likely to pull sights to the right or left. The key with the P320 is it is the same trigger pull every time. Overall, the SIG P320's trigger is an asset with its consistency. With the P320 AXG Scorpion, the SIG SAUER's attention to detail is instantly sensed. Crucial items such grip texture, trigger and maximizing getting the shooters hand as near the bore axis as possible are seamlessly interfaced between handgun/shooter. Years of experience allow for SIG SAUER engineers to take the nebulous concept of "feel" and translate it to being one of best-shooting pistols on the market, right out of the box.

As stated earlier the P365's XRay3 Day/Night sights are a vast improvement compared to other sub-com-

The SIG P365 proved adept at performing in numerous personal defense situations, including around vehicles (where we spend so much of our time as we go about our business).

pacts on the market. Accurate fire was easily achieved at distances normally reserved for full-size handguns. The P365's design allowed for minimal felt recoil and ease of getting multiple shots off quickly. IWB carry was the main emphasis with the P365 during visits to the range. More of a point shooting or flash sight picture was utilized, along with one-handed firing grip. This is a realistic way of analyzing what the P365 brings to the table for users considering using it in the role it was designed for—concealed carry personal defense. The SIG trigger, combined with P365 ergonomics, produced superior accuracy in terms of personal defense compared to the author's previous experience with other polymer semis or snubby revolvers.

The handy nature of the P365 makes it indispensable. Many will find it their primary carry weapon by default, especially in summer months or under social conditions where discovery of a concealed carry weapon is untenable. Ultimately, always having a weapon with you is more important than the full-sized weapon you leave at home because you did not feel like dressing around your handgun on any given day. The SIG P365 offers an excellent size-to-firepower ratio for the practitioner of concealed carry.

Key to both pistols' success are minimal operating controls, high cartridge capacity to size ratio and relentless reliability. Simplicity should not be confused as lack of refinement. The desire of any end user when selecting a personal defense handgun is that it performs under the most dire conditions. The SIG SAUER P320 AXG Scorpion and P365 Nitron Micro-Compact satisfy this quest. SADJ

WEBSITES OF INTEREST

SIG SAUER
sigsauer.com

DeSantis GunHide
desantisholster.com

Galco International, LTD
usgalco.com

Remington 870 shotgun, STANDDOWN less lethal rounds packaging and two rounds.

A Useful Less Lethal Option

Story & Photography by Seth R. Nadel

The search for a trustworthy less lethal option to firearms is ongoing. It is not easy to reconcile a less lethal solution with a reasonable expectation of stopping an attacker. All manner of things have been tried—for example, pepper spray. I was a pepper spray instructor for my law enforcement agency, during the course of which I had to be sprayed. First, we would receive an hour-long lecture on how we would "never again" have to fight with an attacker. Then we went outdoors, where the wonders of pepper spray were demonstrated on the two instructors.

The visiting expert shook up the spray and sprayed me in the face *with no effect!* He shook the can again and really hosed me down—all I felt was a slight prickly sensation on my face. He looked at the can and then gave me another long shot, which only caused me to cough lightly. He sprayed the other candidate who dropped like a box of rocks, after which, I also went down. So much for the "wonderful new spray!" Had I wanted to, I could have fought the sprayer and used the chemical on him! Our policy was to

Two projectiles' impact on a cardboard target.

not use pepper spray unless another officer was present and ready to use deadly force.

Later came the electronic devices, most commonly the Taser. On the internet you can watch video after video of perpetrators ripping the barbs out of themselves. Recently there was a case of an individual attacking a police officer with a knife. He had been pepper sprayed and tased twice with no effect, so he had to be shot to stop his attack. Even firearms do not always work, as the criminals can sometimes absorb hit after hit without stopping.

A New Approach

The aptly named Avert Industries has entered this arena with a new approach, which may avert the need to lethally shoot. They have developed a polymer/metal projectile intended to cause pain compliance without lasting physical harm within a certain range envelope. STANDDOWN™ less lethal ammunition has lightweight (5.0 grams / 77 grains) lead-free projectiles which move at a low velocity (average 550fps). The polymer is specially concocted with a "Rare Earth" metal to remain soft and pliable at temperatures well below freezing—as low as -20° F. Loaded into 12 gauge rounds with 2 projectiles, your existing shotgun serves as the launcher. I noticed that the projectiles barely bounce off a hard surface—dropped from about 6 inches, they only rise about 1 inch from a hard tabletop.

With the metal contained throughout the soft projectile, nearly 100% of the kinetic energy gets transferred to the target, spread over an area larger than the projectile as that material spreads the force of the impact. Of course, there is a minimum range (estimated at less than three yards) where injury could occur. Due to the light weight and low velocity, accuracy and impact velocity drop off beyond 20 yards.

There is always a danger in attempting to use a lethal weapon in a non-lethal way and I would suggest that a separate, clearly identifiable shotgun be used *only* for the STANDDOWN rounds. Even those of us who have demonstrated "coolness under fire" can make a mistake and fire a lethal round when a STANDDOWN was intended. I do not know the level of injury sustained within 3 yards, as I had a very difficult time when looking for test subjects—with zero volunteers.

There is a warning on the packaging that only large muscle groups and the body from the abdomen and lower should be targeted, which can be very difficult in a dynamic situation where you and your attacker may both be moving. You must believe that lethal force is justified, even when using a dedicated less lethal shotgun. An errant projectile could cause significant harm.

STANDDOWN less lethal rounds packaging and two rounds.

Test Firing

For testing, I used my veteran Remington 870 with rifle sights, my companion on many arrests in my law enforcement career. The first shots were from 20 yards, on a double-thick cardboard target. There certainly was no recoil and little noise, although I did wear hearing protection. It was 40 degrees F, with a 10-15mph breeze from left to right on the range. I noticed that all the projectiles that missed, missed to the left—into the breeze I aimed lower and the next two balls hit close together.

From 25 yards, I got one ball to strike the target from each shot. The holes are slightly larger than the balls, suggesting they were starting to deform just before penetrating the cardboard. No projectiles were recovered.

Since 30-50mph winds are not uncommon in the mountains where we live, I fired more rounds in higher winds to see what effect the wind had that caused the first 2 balls to miss. A storm blew into the area, giving me the chance to fire in stronger winds—20-30mph gusts. It was blowing from right to left this time, from about one o'clock. I fired from 15 yards and all the projectiles struck the target to the right (into the wind). Several sets of the balls struck very close together—almost touching. Within the range limitations, all projectiles hit the target.

I am "risk averse" and will do just about anything to avoid using lethal force. I also do not want to display a firearm unless I have a reasonable expectation of needing to use it to stop a deadly attack. My U.S. state allows display of a firearm in order to deter a potential attacker, but I would never bluff with a gun. The STANDDOWN rounds could "Avert" the need to apply deadly force, but there are still risks.

Within these limitations, the Avert Industries STANDDOWN rounds could dissuade those who mean you harm from continuing their attack. In the violent unrest seen in major cities around the U.S., there would be a definite place for these rounds in protecting lives and property from crimes, like arson.

Until they develop a "phasers set to stun" option, like on *Star Trek*, these rounds could save lives. SADJ

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Civilian AK-12 and AK-203.

AK-203

A Natural Progression of the AK Platform

Story & Photography by Lynndon Schooler

It can be a natural assumption that firearms development in different nations follows the same general formula. There is a market need for improvement in order to face a new threat or adapt to a technological advancement. Firearms design then responds. The push and pull of civilian and military design requests create a balancing act, where manufacturers invent products to meet lucrative government requests for proposals or export contracts, while a civilian-marketed variant provides supplemental income in case they are unsuccessful in catching the government's eye. The end user, per design philosophy, most often conflates the civilian, military and police shooter.

In Russia, typically this is not the case. Over the years, I was lucky to have the repeated opportunity to visit Russia and try out some of their more interesting and rare firearms. It has cost me a fortune in plane tickets and more than one fingertip to frostbite but, as a whole, it has truly brought me an understanding of Russian firearms development—as it feels concretely in the hands and against the shoulder. Regrettably, this experience has taught me that Russian design improvements usually focus on the cosmetic. Within the hallowed halls of the Tula and Izhevsk design shops and production facilities, there is an ingrained "if it ain't broke, don't fix it" philosophy. It would be unfair to say this only affects Russia, but Russia is definitely mired in the problem.

Still to this day, the majority of Russian single-year contract provincial

military conscripts is fielded surplus AK-74M rifles or earlier AK-74s from the Soviet-Afghan War, eternally racked and re-racked from demobilization to demobilization. They're fired wet and frosty. Their varnished stocks are worn bare and their metal coatings rubbed away to that distinct, yet decidedly undeserved, "battlefield pick-up grey." Their plum/black magazines are littered with bayonet etchings of discharge months, girlfriend's names, hometowns and outpost stations. The firearms handed to the average Russian soldier had not substantially changed since the early 1980s. Until the Russian action in Syria, fighting the enemies of the Assad regime, the "good stuff" rarely got into their hands.

The good stuff itself was the product of the small teams of "chief constructors," eking out a government contract by implementing a cosmetic facelift of an older design. Meanwhile in the U.S., design improvements continue to be driven in tandem by government requirements, requests from end users and the civilian marketplace. This is where the AK-200 series goes against the grain. While an offshoot of the Ratnik program to put modernized AKs in the arms of Russian Spetsnaz, the gun was widely brought into existence solely by customers' recommendations, including the practical shooting community, and not a formal government request. In 2007, Izhmash put the design into construction.

The weapon was the AK-203 in select fire for domestic and international military customers. The civilian version, the Saiga MK version 105 (not to be confused with the AK-105), had a three-pin fully automatic firing group, altered slightly to work only as a semiautomatic. The gun was pitched to be part of Russia's growing civilian shooting community, which wanted greater modularity, accuracy and precision from the Russian domestic arms market and more options than Olympic-style and hunting weapons. The weapon was full length and chambered in the classic M39 7.62x39mm Soviet round of the AK and AKM. Its development was not groundbreaking, though it would be dishonest to say it was simply a facelift. The AK-203, either by production methods or design, is made with tighter tolerances, performance and a focus on multipliers without dropping the classic bulletproof Kalashnikov design practices. Unlike the typical 3-4 Minute of Angle (MOA) of other AKs, including new production models, the AK-203 has an average MOA of 2 inches due to tighter barrel fitment. It was also the first AK to incorporate a hinged M1913 railed dust cover, even before the second generation Vityaz, SN.

AK-200 rear trunnion and top cover interface. Note that AK-12, 15 and 200 series all use the same rear trunnion.

Prior to this, Russian special operators were importing hundreds of U.S. aftermarket railed dust covers and deploying them in the field, ironically displaying Texas Weapons Systems gear in some of their most sensitive missions. The AK-203's dust cover is secured to a new rear sight tower tensioned with a new rear sight leaf doubling as the spring for the dust cover and the sight spring. A new rear trunnion design is used, while the rear trunnion is the same as used on the AK-12 and AK-15. The modernized rear trunnion used in all three models has two vertical arms that curve backward. The dust cover uses a camming bar connected to the dust cover latch, which when closed, cams forward to lock against the trunnion arms. Moving the lever down 180 degrees unlocks the dust cover, reminiscent to an SVD or an SKS. The M1913 rail itself is aluminum and riveted to the dust cover. The for-

Handguards, AK-200 uses the same interface as all previous AK generations, allowing it to use previously-available rail systems.

ward polymer furniture also features M1913 rails at the 3 o'clock, 6 o'clock and 9 o'clock positions. The upper gas tube has a rail at the 12 o'clock position. The rifle is fitted with standard safety and AK-12 pistol grip with an oiler in it and a cleaning kit is held in the buttstock in typical AK fashion. A new 24mm flash hider, reminiscent of the experimental Soviet "night flash hiders" of the 1960s, has impressive results in masking the flash signature.

The platform was produced quietly and in few numbers for years, until suddenly the "modernized AK" field became very crowded. Per the Ratnik program's mission, upgraded platforms needed to be in both 7.62x39mm and 5.45x39mm. Izhmash submitted the now famous but troubled AK-12 for the 5.45mm requirement, and the AK-103-3 (an AK-103 with modernized furniture) for the 7.62mm requirement. By 2015, Izhmash, now named Kalashnikov Concern after bankruptcy restructuring, dropped the AK-103-3 for the Ratnik offering after chambering up the AK-12 to 7.62x39mm under the designation AK-15.

However, in 2016 the AK-200 series was able to come back out of the shadows due to the Ministry of Defense's sense of urgency to field-modernize weapons in the face of the Syrian conflict. The AK-203 was accepted for government service with the GRAU (Russia's Main Missile and Artillery Directorate and the authority on Russian arms procurement) index number of 6P45-1. The weapon was fielded sporadically as a stop gap while Kalashnikov Concern ramped up production of the AK-12 and AK-15. Because of the AK-200 series' robustness and the disappointment among some operators with some features of the latest AK-12 and AK-15, the AK-200 series has become a scarce and highly-demanded commodity. Therein lies the irony, that a weapon launched independently in response to consumer consensus on improvements to the AK platform was overshadowed, but still not outperformed, by the mainstream government-mandated AK-12 and AK-15.

I held the AK-203's civilian twin, the MK 105, on a scrubby, dusty, sprawling range in Orenburg positioned on the windswept green and brown flatlands north of the Kazakhstan border. The gun felt slightly beefier, similar to a Vepr, but overall the ergonomics were identical to the AK-100 series. So was the recoil impulse under fire—a sharp and direct chop when fired offhand and prone. The muzzle climb was minimal for 7.62, similar to the work of the twin ported AK-74 style brake on the AK-103. The trigger pull was nothing special, just the familiar 6-8 pounds typical of other Soviet legacy triggers. The flash hider, however, was exceptional, creating an ephemeral and barrel-concentric spark caged in the long tines of the muzzle device and instantly dissipating in the twilight. It is a rare feat when a designer combines effective compensation with flash suppression. The AK-200 appeared more modular and immediately accessible for current after-market components built for the previous generations. In conclusion, it appeared the AK-200 series achieved the goals of the AK-12 with a more competent and trusted design, and earlier than its competitor.

View of the rear of the receivers and top cover. Note an extra rivet below the safety, this is connected to a device which disables the trigger when the stock is folded (for Russian civilian firearm overall length regulations).

It is rapidly becoming apparent the AK-12's evolutionary design has fallen victim to compromise from production restraints and government requirements. The desire to use the same receivers and trunnions as used in prior AK generations shoe-horned the AK-12 into becoming, essentially, an alternative design to the AK-200. While the AK-12's outcome was a regression from its earliest prototypes, the AK-200 was not a compromise, but a natural progression on the AK platform. With the political and marketing inertia in Moscow behind the AK-12, the future of the AK-200 series in Russia remains in doubt. However, the weapon may see new life on the international market, as many foreign nations' militaries recognize the platform as a cheaper and objectively better design. SADJ

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Elbit Systems U.S. Subsidiary Awarded $79 Million ID/IQ Contract to Supply Components for the Bradley Infantry Fighting Vehicle

Elbit Systems of America, LLC ("Elbit Systems of America"), was awarded an Indefinite Delivery/Indefinite Quantity ("ID/IQ") contract by the Defense Logistics Agency Land to supply the U.S. Army with gunner hand stations, commander hand stations and circuit cards for the Bradley Infantry Fighting Vehicle ("IFV"). The contract, with a maximum value of up to approximately $79 million, will be performed over a 5-year period. An initial purchase order of approximately $26 million under the ID/IQ contract followed by a second purchase order of approximately $12 million have been issued to be executed over a three-year period.

The gunner hand stations enable crew members to target and fire accurately and work in collaboration with the commander hand stations that drive the IFV's turret and initiate signals to the turret fire control systems. The circuit cards provide processing and power supply to the hand station units.

Raanan Horowitz, President and CEO of Elbit Systems of America, said: "Elbit Systems of America is proud to offer critical ground vehicle modernization solutions for the U.S. Army to support accuracy and lethality for Soldiers. Receiving this task order to support the Bradley Infantry Fighting Vehicle means U.S. ground forces remain equipped at all times with the very best technology to complete their missions."

FoxFury Partners with Autel Robotics to Launch a Drone Spotlight System for the EVO II

We're excited to announce the launch of the D100 Drone Search/Spotlight System for the Autel EVO II aircraft. As part of our expanded partnership with TacSwan and Autel, these new features enable the Evo II the ability to have a searchlight, payload delivery system, and leg extensions.

The D100 searchlight/spotlight features:

- Made In the USA
- OSRAM LED Lighting
- 2300 Lumens
- ·Battery Life of 70 Minutes
- 5700, 70 CRI
- 60' Wide Light at 200'
- 5-degree Focused Beam
- Water Resistant
- Impact Resistant
- Meets NFPA 1971 – 8.6 (2013)

The D100 is secured to the EVO II by the EXOLANDER® apparatus allowing proper center of gravity integrity. The EXOLANDER® has ten hardpoints for various accessories and can be attached or removed from the EVO II without tools.

"Our engineering team has developed a solution that is rapidly deployable, ultra-rugged, and affordable. Designed for public safety, we've partnered with Autel to support their programs. We've enjoyed great success with the D3060 lighting on the EVO Series aircraft and anticipate similar successes with this new accessory lineup," said Mario Cugini, VP of FoxFury Lighting Solutions.

The D100 Lighting System is available through **Autel.com** and their list of resellers.

ČZG – Ceská zbrojovka Group SE to acquire Colt

Colt Holding Company LLC ("Colt") hereby announces that on February 11, 2021, it executed a definitive agreement to be acquired by CZG – Česká zbrojovka Group SE ("CZG" or "the Group") Colt is the parent company of U.S. firearms manufacturer, Colt's Manufacturing Company LLC, as well as its Canadian subsidiary, Colt Canada Corporation.

Subject to the terms and conditions of the definitive agreement, CZG shall acquire a 100% stake in Colt for upfront cash consideration of $220 million, and the issuance of 1,098,620 shares of newly issued CZG common stock. The agreement also provides for potential earnout consideration of up to 1,098,620 shares of newly issued CZG common stock if defined EBITDA thresholds are achieved in the years 2021 – 2023.

Commenting on today's announcement, Lubomír Kovařík, President and Chairman of CZG, said: "This merger is a strategic step for both companies. The acquisition of Colt, an iconic brand and a benchmark for the military, law enforcement, and commercial markets globally, fits perfectly in our strategy to become the leader in the firearms manufacturing industry and a key partner for the armed forces. We are proud to include Colt, which has stood shoulder-to-shoulder with the U.S. Army for over 175 years, in our portfolio. We believe in the successful connection of our corporate cultures, the proven track record of the current management team, and the complementary nature of the CZ and Colt brands. The combined group will have revenues in excess of USD 500 million and presents a real small arms powerhouse. The experience of CZ and Colt management will further strengthen both brands and ensure CZ and Colt continue to deliver top quality products and solutions to all our customers."

Dennis Veilleux, President and CEO of Colt, agreed: "We are very pleased with the prospect of such a strategic combination. Having completed a historic turnaround of the operations and financial performance at Colt over the past five years, this important next step with CZG positions the company to take advantage of significant growth opportunities. We are excited to join forces with CZG which will be a powerful combination for both brands and for our customers."

The acquisition is to be financed from CZG's existing cash resources, including recent IPO proceeds, and from a contemplated bond issuance by CZG.

The transaction is subject to regulatory approval but is anticipated to close in the second quarter of 2021.

With this strategic move, CZG will acquire significant production capacity in the United States and Canada, and substantially expand its global customer base. Colt is a traditional supplier to global military and law enforcement customers. Among others, Colt is a long-term supplier to the U.S. Army (with whom their relationship dates back over 175 years) and, through its Canadian subsidiary, Colt is a designated exclusive supplier of small arms to the Canadian military.

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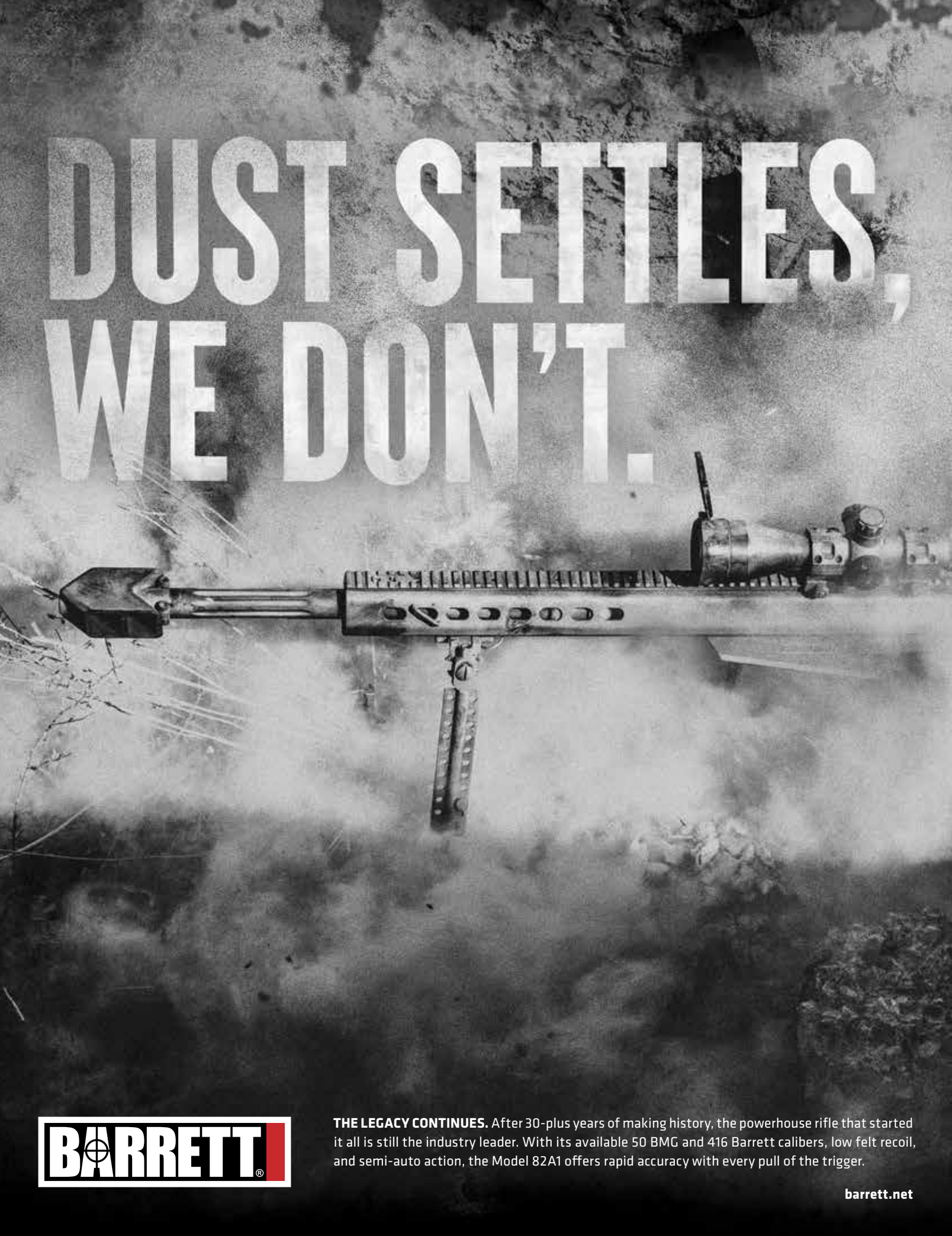

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